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for the Year 1926),*

THE
MEDICAL AND SCIENTIFIC ARCHIVES
OF THE
ADELAIDE HOSPITAL.

No. 6 (for the year 1926.)

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THE
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For some time it has been thought desirable that the experiences gained at the Adelaide Hospital in the study, diagnosis, and treatment of diseases should be, from time to time, summarised, and the position as it were consolidated. Each large hospital must develop in one direction or another along special lines, and its experiences should be available for the information of other hospitals. In the present Archives we have the opportunity of publishing a review of Vaccine Treatment at the Adelaide Hospital over a period of 11 years. An epitome is given of the bacteriological findings in various diseases, and the results of their vaccine treatment have been summarised. This means that the experiences of the Bacteriologist in Charge of the Vaccine Department, now the Honorary Vaccinist, are made available for the information of other members of the Honorary Staff and the Resident Staff, as well as outside practitioners. Medical men can ascertain in what classes of cases vaccine treatment at our hands has been successful, and in what classes the results to be obtained are doubtful or of no value.

Another addition is a brief record of certain pathological lesions present in 1,000 autopsies at the Adelaide Hospital between the years 1920 and 1926. Further issues will continue this series until a summary of all the lesions present has been completed.

The inclusion of the review of vaccine therapy has necessitated reducing the number of case records in this issue. A number of others that are worthy of record have had to be postponed.

The Committee are again indebted to the Inspector-General of Hospitals and to the other members of the Board of Management for their interest and support. The Medical Superintendent and the Medical and Surgical Registrars have rendered much assistance in the compiling of the cases.

I.—HYDATID DISEASE.

HYDATID CYSTS DETECTED ON *POST-MORTEM* EXAMINATION.

(Reported by the Honorary Pathologist.)

(1) *Hydatid Cysts of the Liver and Meso-Colon*.—Mrs. H. H., *æt.* 51, was admitted, under the care of Dr. Hone, Hon. Physician, on December 7th, 1925, with heart failure. She had been jaundiced for the last fortnight. The liver was enlarged, and there was a firm, hard, lobular tumor projecting from it. She had had operations for hydatid disease five years ago, and again two years previously. Mitral regurgitation was present, and there was a to-and-fro aortic murmur. The hydatid complement fixation test was a negative.

Autopsy No. 37/26.—There was a nodular mass of hydatid cysts, triangular in shape with each side about 3 in. long, in the meso-colon near the hepatic flexure. The mass consisted of three separate cysts each about 1½ in. in diameter showing a tendency to exogenous budding. The liver was somewhat nutmeggy, and there were several hydatid cysts collapsed, though full of fluid, in the neighborhood of the diaphragm in the right lobe, forming a mass 1 in. or more in diameter. A further group of nodular cysts 1½ in. in diameter was present in the extreme right of the right lobe on the under surface between the ribs and kidney. Numerous brood capsules were present in the daughter cysts. The heart was slightly hypertrophied and dilated, and death was due to heart failure or myocardial degeneration.

(2) *Degenerated Hydatid Cysts of the Liver and Left Side of the Diaphragm*.—H. L., a male, *æt.* 78, was admitted on May 28th, under the care of Dr. Hone, Hon. Physician, having had a stroke and hemiplegia. He died two days later.

Autopsy No. 107/26 showed that death was probably due to cerebral thrombosis. There was some silicosis present. The left lung was adherent at its base to the centre of the left cupola of the diaphragm over a puckered area about 1½ in. in diameter in the diaphragm itself where there was a calcified mass flattened and over half an inch thick. Old hydatid membrane could not be recognised in the calcified mass. In the liver was a caseating hydatid cyst nearly 3 in. in diameter in the upper anterior surface of the right lobe with some compensatory hypertrophy of the left lobe.

Comment.—There seems little doubt that in this patient the calcified mass in the cupola of the diaphragm was the result of degeneration of an hydatid cyst in this muscle, inasmuch as a degenerated hydatid cyst itself was found in the liver substance.

II.—MEDICAL CASES.

1. CASES ILLUSTRATING GANGRENE AND ORGANISATION OF THE LUNG, FOREIGN BODY IN THE LUNG, AND PRIMARY NEOPLASMS OF THE LUNG.

(Reported by Professor J. B. CLELAND, Honorary Pathologist.)

A group of cases came to *post-mortem* examination during the year, linking up to some extent these various conditions with each other. In the Adelaide Hospital we find that organisation of pneumonic exudate is by no means infrequent. The degree and

extent of the organisation varies. In some cases the patient dies at an early stage when organisation has merely commenced; in other cases organisation is advanced, and the affected lung may be fleshy, carnified, and almost airless. The area affected may be small or may affect the whole lobe or almost a whole lung. In some cases the organisation seems to have followed a typical lobar pneumonia; in others it has probably followed an irregular type of pneumonia, especially that associated with influenza. It is probable that an inefficient leucocyte response in the exudate in the alveoli is the reason why the exudate becomes organised instead of being absorbed. In such an organising lung tissue the alveolar or bronchiolar epithelium may continue to live though more or less embedded in fibrous stroma. Sometimes its proliferation is very obvious, and we believe that such epithelium may from time to time undergo a carcinomatous change and result in the development of a primary carcinoma of the lung. Possibly one of the cases of primary carcinoma of the lung here recorded may have had such an origin.

Gangrene or extensive necrosis of the lung is another complication of lobar pneumonia and of the more irregular forms of pneumonia. When partial organisation has occurred, in places we may have a retention of inflammatory products. Secondary infection may lodge in such areas, probably being derived in some cases from inhalation. When extensive necrosis occurs as a result of such secondary infection with putrefactive organisms death in the majority of cases probably follows. During the year three cases of necrosis of portions of the lung, a condition generally spoken of as gangrene, were met with within six weeks of each other. An example of the inhalation of a larger substance, viz., a fish-bone, was also met with. This had been present for 10 years, and had given rise to a bronchiectatic cavity with surrounding fibrosis.

(a) GANGRENE OF THE LUNG FOLLOWING PNEUMONIA.

Under the care of Dr. Cowan, Honorary Physician.)

G.M., a single man, *æ.t.* 45, was admitted on the 6th of May complaining of pain in his side which he had had for two weeks. He had at first noticed a cold in the head. He had had a dry hacking cough for 10 to 15 years, and had had double pneumonia five years before. On examination he was gaunt, and with a very evil-smelling breath. His temperature was 100° F. His teeth were very carious and neglected, and he had muco-pus in his pharynx. Examination of the lungs showed extensive breaking down of both lungs, especially on the right side. He was treated with potassium iodide, ammonium carbonate, and infusion of senega, and was given creosote pills. His sputum was examined on several occasions, and contained no tubercle bacilli, but pus cells were present. His blood yielded a negative Wassermann reaction. In a radiogram of his chest irregular opacities were seen throughout the lung fields, especially in the middle third of each lung, leaving the apices comparatively clear. On the left side there was a good deal of pulmonary consolidation surrounding some large cavities. His temperature ranged between 98° and 103° F. His breath became still more malodorous, and it was necessary to remove him out of the general ward. On the 13th of June he died.

At the autopsy (No. 117/26) patches of necrosed tissue were present in both lobes of the left lung, the areas having foul contents and grey necrotic walls. One cavity was 2in. in diameter. In the right lung in the upper lobe were some small gangrenous cavities the size of walnuts, and elsewhere some small abscess cavities. In the left lung there was some partial grey hepatization with early organisation. The partial organisation of small areas was confirmed microscopically

where alveoli were seen in process of obliteration by diffuse connective tissue. There was nothing else of importance save great emaciation and very dirty teeth. Films from the necrosed lung tissue showed gram positive and gram negative filamentous bacilli, but no spirochaetes, though these were present in a film from the teeth.

Comment.—It seems probable that complete resolution had not followed the patient's double pneumonia five years previously, but that partial organisation of the exudate had occurred in places. It is possible that the gangrenous areas had followed on abscess cavities similarly an aftermath of the imperfect resolution of the pneumonia.

(b) GANGRENE OF THE LUNG.

(Under the care of Dr. F. S. Hone, Hon. Physician.)

C. H., a male, *æ*t. 72, was admitted on May 20th complaining that he had had a bad cough for two or three days. He had been in his usual health until two days before, when he began to cough a great deal. He had had a slight cough for about six months, and had had a similar attack at Broken Hill a year before. Two years before he had had a paralytic stroke. He was a very pale, old man with Cheyne-Stokes respiration, and wandering a little in his speech. He had left-sided facial paresis: the left pupil was small and fixed, the right normal: the lips were cyanotic: the tongue dry and brown, and breath fœtid. His apex beat was in the fifth left interspace in the midclavicular line. There was a soft systolic murmur audible in the aortic area. His arteries were sclerotic. His systolic blood pressure was 195 millimetres, diastolic 135. Rales were audible over the fifth and sixth ribs in front on the right side. On the left there were sibilant rhonchi. There were rales in both axillae and at both bases posteriorly. There was albuminuria and evidence of old hemiplegia. The rest of the physical examination showed nothing noteworthy. On the 20th May he was venesected to 24ozs. On the 21st he was still distressed with Cheyne-Stokes breathing. He was given oxygen and a hot pack. His temperature rose to 103° F. On the 26th his temperature was up to 101.8° F., respirations 36 to the minute. There was bronchial breathing over the lower lobe of his right lung posteriorly. He gradually became more toxic, and refused his medicine and food. His breath and sputum became more offensive, and on the 6th of June he died. A blood culture done on the 24th May yielded *Staphylococcus aureus*.

Autopsy No. 114/26 showed the lower lobe of the left lung contracted, reddish and granular in appearance (carnification). In the lower part of the upper lobe of the right lung was a dark gangrenous area about 3in. in diameter, the contents of which were diffuent and easily washed out, leaving a cavity. Adjacent to this area the lower part of the upper lobe was in a state of red hepatization, and at the base of the lung there was again early carnification. There were atheroma of the coronaries and an enlarged prostate and two miliary abscesses in the cortex of the right kidney. Sections of the lung showed organisation with many new blood vessels, and also an abscess cavity.

(c) GANGRENE OF THE LUNG.

(Under the care of Dr. Fry, Honorary Assistant Physician.)

F. P., a single man, *æ*t. 66, was admitted on 14th of June. No history could be obtained from the patient except that he had been ill for a time with a cold in the head and had been shivery. His temperature on admission was 102° F., his pulse 140 to the minute, respirations 42. He was in slight respiratory distress. He had sordes

on his lips. There was some dilatation of the heart, and he had signs of pneumonia at the base of the right lung. He died on the 16th of June after having been delirious during the whole of his stay in hospital.

Autopsy No. 122/26.—On opening the thorax, air escaped from the right pleural cavity, the lung being collapsed and compressed against the vertebral column. There were also 36ozs. of blood-stained fluid (almost pure blood). The surface of the pleura was greenish white, and discolored and covered with a thin pyogenic film. Examination of the collapsed right lung showed that the lower lobe was ragged and disintegrated, and smelt offensively. Blood clot was present, but it could not be ascertained from which part of the lobe the blood had escaped. The upper and middle lobes were collapsed. Near the apex of the left lung were a small fibrous patch and small bronchiectatic cavities, and a caseated area the size of a grain of wheat. Sections of the lung showed a small tuberculous area in one part; the necrosed lung tissue showed grey hepatization with areas of necrosis and numerous large bacilli.

Comment.—In this case it seems likely that imperfect resolution had followed on a lobar pneumonia, and that infection had supervened; the lung tissue had become disintegrated, and a pneumo-thorax, subsequently becoming a pneumo-haemo-thorax, had followed.

(d) FOREIGN BODY IN THE LUNG AND CARCINOMA OF THE RECTUM.

(Under the care of Dr. Cowan, Honorary Physician.)

W. P., a single man, *æt.* 68, was admitted on 3rd June, complaining of cough which he had had since he inhaled a fish bone 10 years before. Dr. Poulton had told him he had a cavity in his lung. Three weeks before he came into hospital he got numbness in his legs and thighs, and became gradually weaker. He had been losing weight for the last year. His bowels were not opened regularly, and he was obliged to take laxatives. Signs of broncho-pneumonia were found in his right lung, and it was thought that the physical signs also indicated a cavity in the right lower lobe. No knee-jerks could be elicited. There was oedema of the ankles and feet. His lower limbs were very flaccid. On rectal examination nodular, tender masses were found on the anterior wall of the rectum, and were thought to indicate a malignant growth of the prostate. His pulmonary condition became gradually worse; his temperature rose to between 99° and 100° in the evenings, and on the 13th of July he died.

At the autopsy (No. 145/26) an early carcinoma of the rectum was detected on the anterior wall in proximity to the prostate: a small deposit, confirmed microscopically, the size of a swollen pea, was present in the liver. Both lungs showed considerable emphysema of the upper and anterior parts. The lower lobe of the right lung was collapsed and consolidated, forming a mass the size of a fist. On section, a large, deeply congested bronchus was seen running into a contracted, rather tough, lung with several irregular cavities, one opening into the bronchus. A small fish vertebra, the size of a dried pea, fell out of one of the cavities. In the upper lobe there was a small patch of broncho-pneumonia, and pus escaped from some of the bronchi. Sections of the wall of the bronchus where the foreign body had lain showed destruction of the epithelial covering in parts, with inflammatory cells and fibrosis, and also an area where metaplasia of the epithelium had occurred, the columnar epithelium being converted into a squamous epithelium.

Comment.—The metaplasia of the columnar epithelium lining the bronchiectatic cavity into squamous epithelium is of interest.

(e) MALIGNANT GROWTH SURROUNDING THE LEFT BRONCHUS,
POSSIBLY OF OVARIAN ORIGIN.

(Under the care of Dr. de Crespigny, Honorary Physician.)

C. M., a female, *æt.* 36, was admitted under the care of Dr. de Crespigny on 10th February. The patient was very drowsy. Her husband stated that nine weeks before she had become sick with a "cold on the chest." Three weeks before admission she had become worse, and had been in bed since. During the last two days she had become a great deal worse, and complained of pain in her chest. Her temperature was 98.8° F., pulse rate 126, and respirations 28 to the minute. She was a fat woman with shallow breathing. Her lips and finger tips were cyanosed. There was only a slight respiratory excursion of the chest. The percussion note was resonant on both sides, but no breath sounds could be heard anywhere in the left lung. On the right side the breath sounds were high-pitched, and expiration was prolonged. Her urine contained alumen and blood. She died two days later.

The rest of the physical examination showed nothing noteworthy.

Autopsy No. 28/26 showed on opening the left pleural cavity an outrush of odorless air. The left lung did not collapse, and was white in appearance, being partially overdistended with air. There was some interstitial emphysema in some of the septa of the lower lobe. Posteriorly above and behind the left bronchus was a large, firm, whitish, malignant growth more than 2in. in diameter in certain directions, but irregular in shape. It embraced the left bronchus, particularly above and behind, for 2in. of its length, constricting and congesting the lumen and infiltrating the wall though without obvious ulceration. Below the bronchus were several soft walnut-sized deposits in carbon-pigmented glands. A small infarct was present near the apex of the lung behind. The right lung was engorged and without deposits. Fatty tissue only seemed present in the region of the thymus gland. The growth was attached to the inner side of the arch of the aorta. In both ovaries were several soft malignant deposits from a grain of wheat in size to three-quarters of an inch. There was a secondary deposit on the seventh left rib 2in. in front of the angle.

Microscopically, the growth consisted of medium-sized, rather spheroidal, cells in columns or groups with numerous mitoses and much necrosis. The vessels were thin-walled in places, suggesting a sarcoma, though a stroma often surrounded the spaces. There were other areas where the cells resembled much more those of a carcinoma. In the ovaries were deposits of cells forming localised nodules infiltrating at their edges and presenting an appearance like that of the so-called embryonal carcinoma. It is possible that the ovarian growth was primary, and that an early metastasis had occurred near the bronchus and had grown more rapidly than the parent.

(f) CARCINOMA OF THE LUNG AND MALIGNANT ENDOCARDITIS.

(Under the care of Dr. Hone, Honorary Physician.)

K. C., a married woman, *at.* 39, was admitted on the 29th of July. Three months before she came into hospital she had had painful swellings on the backs of her arms and legs. These disappeared in a few days. Soon afterwards she complained of cough, and the doctor called in to see her found physical signs indicative of fluid in the right pleural cavity. This cleared up in a few days. Then two or three weeks before admission mental symptoms led to his being called in.

again. She recovered from this for a time, but the symptoms returned again and had been present ever since. She had had no pyrexia during the whole time. She was a thin woman with a subnormal temperature, quite comatose. Her pupils were equal, and reacted to light and accommodation. Her teeth were carious, and her jaw was clenched. Physical examination of her cardio-vascular system was normal. The blood pressure was 150 mm. of mercury systolic and 100 diastolic. Dullness with weak breath sounds and prolonged expiration were found over the upper part of the right lung anteriorly down to the third rib, and posteriorly down to the level of the fifth dorsal spine. The rest of the physical examination showed nothing material. She had a fair amount of albumen in the urine. Next day her temperature rose to 100.8° F., her respirations and pulse rate increased and she died.

At the autopsy (No. 155/26) the upper lobe of the right lung was found, in its distal part, completely consolidated, firm, heavy, and dark red. The basal half was occupied by a dense, rather hard; whitish new growth extending from the hilum and occluding a branch of the bronchus. This new growth bound the upper lobe of the lung just above its hilum to the mediastinum just below the aortic arch. There was a marble-sized gland in the neck above the left clavicle near the sternum and secondary plaques, one 1½ in. long, on the diaphragmatic pleura on the right side. The pleura over the lower ribs showed also a number of pea-sized and marble-sized nodules. The lower lobe of this lung was compressed a little, and showed a small infarct in the basal rim. The left lung showed several large infarcts. Its pleura was unaffected. A secondary deposit the size of a large marble was found near the left suprarenal gland, and in the liver were several quite small deposits. Malignant endocarditis with low vegetations was present on the aortic and mitral valves. There were some old infarcts in the spleen and left kidney. In the brain on the left side was a haemorrhage, abutting on the longitudinal fissure, and extending for 2½ in. The left occipital lobe was yellow in color from old escaped haemoglobin. The vessels at the base of the brain were healthy. In the left ovary was a small cyst with warty projections on its wall. Microscopically, the growth proved to be a large spheroidal celled carcinoma, possibly of alveolar origin, which was extending in the lung in the form of a cancerous pneumonia. The ovary showed a small deposit of carcinomatous cells with an acinous arrangement.

(2) DIABETES COMPLICATED WITH RENAL ABSCESSSES (CARBUNCULOSIS OF THE KIDNEYS).

During 1926 there appeared to be an undue number of such pyogenic infections as boils and carbuncles. During the year two patients suffering from diabetes died chiefly as the result of multiple abscesses in the kidneys, a condition to which the term carbunculosis of the kidneys, which has been suggested, would seem particularly appropriate. The two cases detailed died within 16 days of each other.

Case I.—D. S., a single man of 60 years of age, was admitted, under the care of Dr. Hone (Honorary Physician), on the 22nd June. He was delirious, and it was learnt from his brother that he had been ailing for the last year. For the last three months he had been very thirsty, and had been passing a quantity of urine. He had been blind for 10 years. His urine contained much sugar and diacetic acid. He was given large quantities of insulin, but died the following day.

At the autopsy (No. 130/26) a small abscess cavity was found in one lung in what looked like an infarcted area. The liver showed some haemosiderin deposit. The kidneys showed no perinephritis. Several bulging abscess cavities up to a quarter of an inch in diameter were present on the surface, and on section a number of small abscess cavities were seen, more especially in the medulla near its junction with the cortex. There were a few smaller ones in the cortex. There was a small abscess near the prostate. The spleen was a little large, not diffuent, but rather firm and dark red. The optic nerves and chiasma were flattened, smaller than normal, and less white. The pancreas was rather small, but not especially fibrotic, and on section islets were present though not numerous, and their cells seemed well preserved. Microscopic examination of the liver showed much haemosiderin in the liver cells, and a definite moderate cirrhosis with numerous small cells, many of them polymorphonuclear cells, in a youngish type of tissue.

Case II.—M. T., a married woman, *æt.* 59, was admitted under Dr. Hone on 14th June. She complained of having weakness and a tight feeling across her stomach. Prior to this she had felt quite well. Her first symptoms had been weakness. She had been passing her urine more frequently of late, and had noticed herself more thirsty for the past 12 months. Except for some "ulcers" in her abdomen six months before she had been quite well. Apart from an umbilical hernia and some scars on her thorax and abdomen, the physical examination showed nothing abnormal. She had albumen, blood, and sugar in her urine. There was no diacetic acid. In spite of appropriate dietetic treatment, she became gradually worse, passing her urine and fæces under her. On the 7th July she had retention of urine, and 30ozs. of purulent blood-stained urine were drawn off. On the 8th July she died. From the 23rd June she had been given large doses of alkali by the mouth. She had passed about 300 c.c. of urine. Her blood sugar varied between 0.11% and 0.15%. On the 24th June her urine contained 0.9% of urea, and on the 9th of July it contained 0.3%. Microscopic examination showed a great deal of pus present and various bacilli and *Streptococcus faecalis*. Her blood gave a negative Wassermann reaction.

At the autopsy (No. 138/26) both kidneys were found enlarged, and showed extensive necrosis with purulent infiltration affecting nearly the whole of the medulla of both sides, giving rise to wedge-shaped areas with radiating striæ extending to the periphery. There was slight perinephritis round each kidney. The bladder was greatly dilated and hypertrophied, and showed necrotic patches in the mucosa, and was full of purulent, slightly blood-stained urine. On its serous aspect there was an exudate of lymph indicating commencing peritonitis. A large right ovarian vein ran close to the right ureter to join the right renal vein. Its lower two-thirds were filled with purulent clot. The ovaries themselves were fibrotic. The spleen showed a fibrosed area, probably an old infarct. Pus from the kidneys gave a growth of a coliform organism, which may have been a secondary invader.

III.—DISEASES OF THE EAR, NOSE, AND THROAT.

(1) MOUTH SPONGE INSPIRED INTO THE RIGHT BRONCHUS.

(Under the care of Dr. H. M. Jay, Honorary Aural Surgeon.)

E. O., a boy, *æ*t. 16, was having a tooth extracted on the afternoon of September 4th when the mouth sponge was inspired during the anaesthesia. The breathing became embarrassed, but settled down after a few minutes. He was brought from Murray Bridge, where the accident had occurred, to the Adelaide Hospital as rapidly as possible. On admission he was somewhat distressed with a flushed face, a temperature of 101° F., pulse 138, and respirations 38. The heart showed nothing abnormal. The breath sounds were absent over all the right lung except immediately below the clavicle. He was given morphia $\frac{1}{4}$ grain and atropine 1-50 grain, and then under ether the bronchoscope was introduced, and a marine sponge with tape attached was removed with forceps from the right bronchus. The patient made an uninterrupted recovery.

Comment.—This case was remarkable from the fact that the sponge in question was as large as a hen's egg. In spite of its size it not only passed the vocal cords but traversed the trachea and safely negotiated the bifurcation to become lodged in the right bronchus. So tightly was it wedged in the bronchus that its removal gave rise to a loud sucking sound similar to that produced by the withdrawal of the piston from a syringe.

IV.—PATHOLOGICAL LESIONS.

(1) LEUCO-SARCOMA (LYMPHATIC LEUKAEMIA WITH NEOPLASTIC-LOOKING INFILTRATIONS) DEVELOPING IN A PATIENT WITH PARAPLEGIA FOLLOWING TRAUMA.

(Under the care of Dr. Beare, Honorary Assistant Physician, and Dr. Smeaton, Honorary Surgeon.)

(With reports by J. BURTON CLELAND, Honorary Pathologist, and L. B. BULL, Director of the Laboratory.)

T. A., a male, *æ*t. 49, was admitted on May 1st, 1924, and discharged on October 27th, 1925, to a nursing home. He was re-admitted *in extremis* on April 28th, 1926, dying soon after admission. When admitted in May, 1924, a history was given of his having fallen between the shafts of a wagon, when his body had been squeezed. He was found five hours later. He had lost all feeling above the groins. His water, he found, was running away from him. He could move his legs. Later his legs became stiff but movable, and he had tingling and darting pains up and down them. He had not been able to control his sphincters. His medical attendant considered that there was probably some compression of the spinal cord. He sent him in with the object of operation. Dr. de Crespigny examined the patient on May 22nd, 1924, and considered that the spinal cord lesion was not complete, and therefore advised spinal decompression in the region of the tenth and eleventh dorsal arches. An X-ray on May 13th showed a fracture of the eleventh left rib near the head, but no other definite bony injury. Laminectomy was performed on May 30th, and the cord exposed, but no bony abnormality was detected, though the spinal cord below D11 was much thinned. There was some discharge from the wound on June 12th. The patient improved somewhat after the operation. He then appears

to have remained *in statu quo*. On December 16th, 1924, he was stated to be slowly improving. On January 24th, 1925, he complained of pain in the left side of the abdomen. Next day his temperature suddenly rose to 103.4° F., with no symptoms to account for it. On January 28th the temperature was back to normal, but the spleen was found to be enlarged, and to extend 3in. below the costal margin. With a change in House Surgeons no further notes appear to have been taken until May, with the exception of a blood examination made by the student in charge on April 21st, showing 45,000 white cells per c.mm., with a great predominance of lymphocytes. On May 12th, 1925, the patient was transferred to a medical ward on account of a lump on the left side of the abdomen projecting from beneath the costal margin. The patient said he knew the lump was there, and that it had been there 11 years at least, and had never given him any trouble, and as far as he knew had not altered in size. The patient still had spastic paraplegia, but otherwise was healthy looking. Enlarged lymph glands could be felt in both inferior maxillary triangles and in both axillæ. The Wassermann reaction was negative and a van den Bergh normal. The blood count showed 4,960,000 red blood cells per c.mm., 37,000 white cells, 65% haemoglobin, and a color index of .74. A differential count showed polymorphonuclears 7%, lymphocytes 89%, large mononuclears 2%, large hyaline cells 1%, myeloblasts 1%. The lymphocytes varied widely in size. The red cells showed no abnormality. On May 16th the patient was noted as feeling quite well. On May 27th the red cells were reduced to 3,970,000 per c.mm., and the white cells had increased to 48,000 per c.mm. The next note is on October 1st, when it was noted that there was no change in the patient's condition. He was still incontinent, and got about in a special wheeled chair. He was sent out to a private nursing home. On April 28th, 1926, he was re-admitted in a very collapsed condition, and in great respiratory distress. He was too ill to give any account of his illness except that he had been short of breath for two or three days. The temperature and pulse were normal. The patient was pale and sweating, and breathing with difficulty. There were palpable glands above the clavicles on either side and in the axillæ and groins. The abdomen was distended, the skin around the umbilicus indurated, and the spleen greatly enlarged, and there was free fluid in the abdominal cavity. The patient died soon after re-admission.

Autopsy. No. 82/26.—The teeth were dirty and the roots exposed. The right leg was swollen. There was about a pint of faintly milky fluid in the peritoneal cavity. The blood in the vessels had not coagulated, and seemed slightly milky. The omentum was relatively free from fat, and the main vessels were accompanied by a diffuse, firm, whitish infiltration extending outwards from the vessels in a pinnate fashion. The mesenteric glands were moderately enlarged and mottled, grey reddish with flesh color. Along the attachment of the meso-colon were festoons of indurated appendices epiploicæ especially numerous in the sigmoid flexure where there were large nodular masses. The spleen was very soft, and surrounded by numerous adhesions; it measured 10in. x 7in. x 4in., and weighed 92ozs.; it retained its shape when removed, showed thickening of its capsule, and was of firm texture; on incision it presented a smooth, rather firm, reddish-mauve-colored surface without infarcts; there was a mass of enlarged, fleshy-pink-colored firm glands the size of almonds and walnuts in the hilum. The liver, which weighed 82½ozs., was rather large and of a peculiar vinous-brown color. The whole of the tissues in front of the aorta extending to the kidneys on each side

showed a diffuse infiltration with a firm pinkish-white tissue. The aorta and inferior vena-cava were embedded in this firm tissue though their endothelial coats had not been penetrated. The infiltration extended laterally on both sides in the perirenal tissues forming cuirasses surrounding each kidney, in the case of the right kidney the mass being lin. thick in places. In this neoplastic-looking casing the kidneys lay embedded as if in a mould. The infiltration had invaded each kidney, not apparently from the perirenal tissues, but by way of the hilum and pelvis, and thence outwards as far as the cortex. In this way a good deal of renal substance had been replaced by new tissue. Both pelves were distended and occupied by branching phosphatic stones embedded in a bath of yellow pus. The suprarenal glands were not detectable in the mass of infiltration. The pancreas was surrounded by infiltration. There were reddish-white lymph glands in the hilum of the liver. The solitary follicles in the colon were discernible to the naked eye, not obviously enlarged, but those in the ileum were more pronounced and nodular. Peyer's patches were not specially enlarged. The inner coat of the stomach was a little thick and roughened. The testes were normal, but in the posterior part of the left scrotal sac and approaching the epididymis was a large infiltrating mass. Partly embracing the trachea near the bifurcation and extending below the bifurcation and behind the heart was a firm, white rather infiltrating mass the size of three walnuts. The thyroid was enlarged, and showed three small adenomatous-looking nodules. The lungs showed some congestion and oedema. The bronchial glands were not specially enlarged. The glands in the axillae were enlarged, reddish, and soft; those in the groin were still larger; the bone marrow in the femur was reddish to greyish. The brain was apparently normal. Death was attributed to toxæmia from double pyonephrosis and to the infiltration of important organs by the leucosarcomatous tissue.

Microscopic sections of a gland in the groin, an axillary gland, a portal gland, and the spleen showed that the tissues were packed with large lymphocyte-like cells. The tissue round the aorta showed a similar appearance, as did the infiltrating mass in the scrotum. The kidneys showed diffuse infiltration affecting also the surrounding fat. In the liver were numbers of large lymphocytes infiltrating Glisson's capsule, although there were only a few of these cells between the liver columns.

(2) LEUCOSARCOMA WITH DEPOSITS PRESSING ON THE SPINAL CORD AND PRESENT IN THE KIDNEYS AND AROUND THE BLADDER.

(*With reports by Dr. J. B. Cleland, Honorary Pathologist, and Dr. L. B. Bull, Director of the Laboratory.*)

A. C. B., a male, *æt.* 38, was admitted to the Adelaide Hospital, under the care of Dr. de Crespigny, on January 8th, 1923, complaining of pains in the legs. These, which had commenced in November, 1922, in the right leg and soon after starting in the left also, were shooting in character. Since then he had also had pain, gripping in character, in the chest, neck, and jaw. The pains occurred in attacks, lasting about an hour, twice a day, and caused loss of sleep. He had also noticed a partial loss of power in both legs. Sphincteric control was normal, but three months before admission to hospital he had frequency and dysuria for a short time—these had since ceased.

Examination of his central nervous system showed no abnormality in the cranial nerves. There was no loss of power in the arms or

left leg. The right thigh muscles of flexion acted more weakly than the left. The biceps, triceps, knee, and right ankle reflexes were not elicited, the left ankle jerk was present. The abdominal reflexes were unelicited, the plantar reflexes flexor. There was patchy anaesthesia of the face, trunk, and limbs. Localisation was normal. There was slight impairment of joint sense in the lower limbs. A Wassermann reaction on January 15th was negative.

A blood examination on January 17th showed red blood cells 4,904,000 per c.mm., white cells 11,000 per c.mm., haemoglobin 76%, and the color index 0.78. There was anisocytosis of the red cells and polychromasia. Two nucleated forms were seen. The white cells consisted mainly of mononuclears. It was thought that the picture was that of an obscure anaemia, probably of marrow origin. A further blood examination was made on January 20th, when the red cells were 3,250,000, haemoglobin 44%. There was slight anisocytosis, slight polychromasia, and many megaloblasts, and a few normoblasts were present. Of the white cells many were immature, and some embryonic. A differential count showed neutrophile polymorphs 6%, immature polymorphs 6%, lymphocytes 80%, eosinophiles 4%, basophiles 4%, and transitionals 1%. Lymphoidocytes were present. The picture was considered that of an anaemia associated with profound marrow change, probably an aberrant functioning which might be classed as a leukaemia. On January 24th the haemoglobin was only 35%, and the patient was now much weaker and dyspnoeic. During the last five days the temperature rose irregularly to as high as 102°. The patient died on January 26th.

Autopsy, No. 10/23.

The Bladder, Prostate, and Adjacent Parts.—In the recto-vesical pouch, over the lower part of the course of the right vas deferens, is an indefinite thickening of the peritoneal surface, on section revealing the vas deferens below with a thickened wall. On incising the bladder an irregular, somewhat projecting mass, more marked on the right side than on the left, is seen occupying the trigone. No separable layer of bladder tissue covers the growth, the somewhat roughened and nodular surface of which appears to form the posterior wall of the bladder. Section shows a firm, whitish, somewhat waxy-looking tissue, suggestive of a dense lymph node, with some small haemorrhagic extravasations.

The bladder, when removed and looked at from the posterior aspect, shows a large, somewhat triangular, neoplastic-looking mass, the apex of which is at the prostate, and the angles somewhat beyond the entrance of the ureters into the bladder. The three sides of the triangle measure 8 cm. each. The base joining the two ureters presents a slight concavity. This mass forms a projection in and below the recto-vesical pouch, its surface being somewhat undulating. It is relatively circumscribed, so that it has been dissected clean from the surrounding tissues.

On transverse section from behind, the growth presents the same appearance as in front, but has incorporated in it the remains of the vesiculae seminales and the prostate. The neoplasm thus surrounds and infiltrates the organs in this situation.

Kidneys.—The kidneys are enlarged. The capsule peels and exposes a kidney surface from which numerous whitish nodules project. These vary in size up to 7 mm. and even 12 mm. in diameter. They have a somewhat waxy-white appearance, and are often flecked with haemorrhages. The surface is smooth and slightly irregular from

the fusion of adjacent nodules. The kidney surface is so studded with these nodules that not much more than half of the normal renal surface is discernible. On section the cortex, both superficial and intermedullary, is as thickly studded with new growths as the surface. The medulla and pelvis seem little, if at all, involved. The whitish growths show, in many instances, central spots of haemorrhage. Their outlines are ill-defined, and the infiltration is in places diffuse. This ill-defined circumscription is in contrast to the appearance met with in secondary carcinomatous and sarcomatous deposits where the nodules of new growth show a more or less clear differentiation from the tissue they are invading. The two kidneys are almost replicas of each other.

Liver.—In the liver only an occasional ill-defined waxy-white nodule is seen. The largest of these measures 12 mm. in diameter, and form a plaque on the under surface of the liver.

Heart.—The heart shows in the epicardium, extending into the subjacent muscle, a few small ill-defined plaques of new growth. In the preserved specimen these are hard to differentiate from the translucent fat.

Ribs.—The affected ribs show some diffuse whitish, in parts haemorrhagic, elevations on the surface.

Spinal Cord.—This shows about 9 cm. from the commencement of the cauda equina an elongated, waxy-white plaque, about 12 mm. long and 7 mm. wide, affecting the pia mater and infiltrating the subjacent cord on its posterior aspect.

Microscopic examination of the affected tissues and organs shows them to be infiltrated with a round cell resembling a lymphocyte, but larger than a normal small lymphocyte and having a more open chromatin network and more cytoplasm. In all the accumulations mitotic figures are to be found. Sections of the liver show areas of intense accumulation of the lymphocyte-like cells. There is also a diffuse infiltration throughout the organ with accumulations in the inter-lobular connective tissue. Sections of the kidneys show diffuse infiltration which increases in intensity in parts so that sometimes none of the normal structure is to be seen in the mass of round cells, but in many places tubules, normal in appearance, are to be seen in the mass of round cells. There is not the destruction of normal tissues that is usually seen in an infiltration of an organ by such a neoplasm as a carcinoma. Sections of the thyroid show a diffuse infiltration of lymphocyte-like cells, and in a section of the rib below the plaque the marrow spaces are seen to be entirely occupied by these cells. In sections from the mass from the base of the bladder the lymphocyte-like cells are seen to be very densely packed. No infiltration was observed in the main nerve trunks of the limbs. In a section including voluntary muscle there is an accumulation of the round cells with some infiltration of the muscle fibres. Sections of the cord fail to show any infiltration of the meninges or substance of the cord, but, unfortunately, the plaque situated in the cord was not preserved for microscopic examination.

Comment.—Delay has occurred in the publication of this case, but this has enabled another example of "leuco-sarcoma" to be observed and recorded with it (see the preceding case). The kidneys in both cases were invaded in a diffuse fashion. In this case, plaques of infiltrated tissue occurred in various situations, amongst these being the pia mater of the spinal cord. Wilfred Harris (*Proc. Roy. Soc. Med.*, XVI., No. 4, Feb., 1923, Sect. of Neurology, p. 18), in an article on Multiple Peripheral Neuritis, mentions a case of leukaemic

polyneuritis (vide *Lancet*, Jan. 15th, 1921, p. 122), in which sections showed that the peripheral nerves were infiltrated with lymphocytes. As it was difficult to conceive of a symmetrical polyneuritis being due to pressure of the lymphocytic exudation on the nerve fibres, he concluded that the neuritis was of toxic origin due to some unknown form of autoxaemia connected with the leukaemic process.

(3) CIRRHOSIS OF THE LIVER WITH ICED-CAKE THICKENING OF THE CAPSULE.—CHRONIC PERIHEPATITIS.

(Under the care of Dr. de Crespigny, Honorary Physician.)

W. H., a male, *æt.* 74, was admitted on the 9th of February, 1925. He had noticed swelling of the feet 10 years previously, and it had occurred occasionally since. Four or five years before admission his abdomen had increased in size. It had been tapped three years before, and again three or four months before admission. He had been getting more weary, and he had lost a good deal of weight. His bowels were regular, and he had no difficulty in micturition. He was passing his urine two or three times a day and as frequently during the night. His temperature was 99° F., his pulse rate 82 to the minute. His abdomen was distended, and the skin over the rest of his body was wrinkled as though there had been considerable wasting. His radial artery was tortuous. His systolic blood pressure was 130 mm. of mercury: diastolic 56. There was a large systolic murmur audible at the apex transmitted outwards, and over the aortic area a to-and-fro murmur, but there was no evidence of heart failure. Besides the distension of the abdomen, which was extreme, there were oedema and bluish discoloration of both legs below the knee. There was slight albuminuria. He was tapped on the 10th of February, 502ozs. of fluid being removed. A day later he left the Hospital at his own risk.

He was re-admitted on the 13th of May, complaining of swelling of his legs and shortness of breath. His pulse was quite irregular. His temperature was 97° F., his heart was as before. He had signs of a collection of fluid in his right pleural cavity, and there was oedema of both legs. His urine contained no albumen or bile. He passed only small quantities of urine, between 8 and 16ozs. a day. The oedema increased, and he died suddenly on the 2nd June.

Autopsy No. 110/26. The body was that of an old man. From a post-mortem cut near the external occipital protuberance several ounces of oedematous fluid had drained away. There was an intense dark bronzing of the shins and oedema of the feet and scrotum. Two hundred ounces of ascitic fluid were present. There were some adhesions round the spleen. There was about a pint of fluid in each pleural cavity. The peritoneal surface was somewhat thickened, especially over the upper surfaces of the liver and spleen. There was a calcified mesenteric gland. The liver, about 8in. long, but weighing 38½ozs., was very small, its thickened peritoneal coat suggesting the icing that is placed on cake; on section it was rather tough, and a fine cirrhosis was evidently present. The gall bladder was filled with yellow bile, and contained a small irregular dark shot-sized calculus. The spleen was dark red and fairly firm, and weighed 5ozs. The kidneys were reduced in size, and showed a pale granular surface; the cut arterioles projected, and there were some small retention cysts. The lungs showed some oedema and compression. There were no other lesions of importance. Microscopic examination of the liver showed great thickening of the capsule and an irregular unilobular cirrhosis; there were some fat globules and coarse haemosiderin grains. The spleen showed an accumulation of haemosiderin, especially round the vessels. The kidneys showed some slight degree of interstitial nephritis.

(4) MULTIPLE MYELOMATA WITH BENCE-JONES ALBUMOSURIA AND RED BONE-MARROW.

(Reported by Professor J. B. Cleland, Honorary Pathologist.)

In an article entitled "The Importance of Bence-Jones Albumosuria in Diagnosis," Dr. E. S. Reynolds (*British Medical Journal*, March 13th, 1926, p. 475) stresses the necessity for careful examination of the urine to detect the possible presence of the peculiar Bence-Jones albumose. He gives details of three cases in which this substance was present in the urine, two of the cases being examples of multiple myeloma. Dr. Reynolds states that Bence-Jones albumosuria is probably commoner than is generally suspected. The first case he details is remarkably like the case we are about to describe, where the diagnosis was only made at autopsy.

Dr. Reynolds's patient was a man, *æt.* 60, who for six months had had pains over the left shoulder and down the arm, which gradually got worse, and then slowly improved, but were still present. These pains were apparently due to an ordinary brachial neuritis affecting the fifth and sixth cervical roots. He had also had for three weeks pains across the front of the upper part of the abdomen, which he put down to dyspepsia. There was a small gland the size of a hazel nut just above the left clavicle. Bence-Jones albumosuria was present in the urine. The pains got worse. The left arm became partially paralysed, and he finally had constant vomiting and intense pains in the head, and died of exhaustion. No post-mortem examination was made.

J. S., a male, *æt.* 70, was admitted under Dr. Guy Lendon on April 7th, 1926, complaining of pains in the back of the neck and shoulders. His illness had commenced about seven weeks previously with these pains in the back of the neck, which had come on gradually, and had been getting more severe, and were present continuously. He had no pain in other parts. He had been following his ordinary occupation, that of an attendant at Minda Home for Feeble-minded Children, until three weeks before admission, when he had to stop owing to the pain. His joints had not been swollen or reddened or in any way troublesome. There was no history of venereal disease; moderate potus was admitted. He had had a family of five children, all healthy. Examination showed that movements of the neck caused pain in the muscles at the back of the neck, the pain radiating towards either shoulder. Pressure on the muscles was painful, especially at their points of origin from the skull. There was no evidence of osteo-arthritic changes in the cervical vertebrae. The chest was emphysematous. One testicle had been removed. There was an old wound on the right forearm. The urine was of sp. gr. 1030, acid and no albumen was recognised at the bedside examination; phosphates were reported to be present. A diagnosis of fibrositis of the neck muscles was made. The diagnosis made by the doctor outside had been chronic bronchitis and arthritis. A week after admission his general condition was stated as being bad, the slightest attempt to move the left arm causing pain in the shoulder and down the arm. The patient died eight days after admission. The temperature had reached 99° on three occasions, and was subnormal towards the end.

At the autopsy (No. 68/26) it was noticed that there were several neoplastic-like growths in connection with various ribs. On incision the growths were found to be in part haemorrhagic and in part whitish, and had eroded through the ribs, giving rise to fractures. The neoplasms formed flattened, projecting masses as viewed from the pleural aspect. One, forming a growth about 1½ in. long (3.7 cm.), was on the left eighth rib opposite the anterior border of the axillary

space. A second smaller growth formed a slight prominence on the vertebral side of the angle of the sixth left rib. On the right side near the junction of the seventh rib with the vertebral column was a marble-sized subpleural nodule, and another was present in the same situation on the eleventh rib on the right side. On the left side of the neck in front of the lower portion of the cervical plexus was a white malignant mass the size of a large marble. The bone marrow of the left femur showed an extensive conversion to a deep red color. The other organs showed no special changes. Only one testicle was present, the other having been removed many years previously. The spleen, which weighed $12\frac{1}{2}$ ozs., was enlarged, dark red, and a little softer than normal. The liver, weighing $62\frac{1}{4}$ ozs., was of smoother texture than normal, rather pale and mottled. The kidneys weighed $6\frac{1}{4}$ ozs. and 7ozs. respectively, and one contained a shot-sized adenomatous nodule. The thyroid, tonsils, mediastinal glands, &c., appeared normal. The bladder was dilated and filled with turbid urine, with some pultaceous material, probably chiefly urates. Miss Long, M.Sc., Biochemist to the Laboratory, kindly examined a small sample of this urine and confirmed our finding of Bence-Jones albumose. She reported as follows:—"The urine was acid, and showed the presence of urates, confirmed microscopically. These were filtered off and the filtrate boiled, when a fairly heavy precipitate formed. This was filtered off while hot. To clear the filtrate a drop of acetic acid was added, and the whole boiled again. It remained clear. On cooling, a precipitate appeared, which disappeared on boiling and re-appeared on cooling again. The clear filtrate showed a whitening at the junction with a layer of strong nitric acid at the bottom of a test tube. This disappeared on gentle heating and re-appeared when cool."

Microscopic examination of sections of a growth from the ribs and the mass in the neck showed the typical appearance of multiple myeloma, being composed of large masses of closely approximated cells resembling fairly closely plasma cells with their excentric nuclei, but a little larger.

(5) CONGENITAL POLYCYSTIC KIDNEYS. WITH A CYSTIC MASS ATTACHED TO THE SMALL INTESTINE.

(Reported by Professor J. B. Cleland, Honorary Pathologist.)

Jack H., a male, *æ*t. 78, was admitted under the care of Dr. Guy Lendon on June 9th suffering from what was believed to be uraemic coma, and died next day. Both kidneys were a little larger than normal, and their surfaces were studded with a multitude of small cysts from the size of shot to swollen peas, the majority being about the size of dried peas. On section the pelvic fat was found to be increased and the cortex to merge into the medulla and to consist of apparently a reticulation of cystic cavities from which escaped a watery fluid. There was a little hypertrophy of the left ventricle, the heart weighing $14\frac{1}{2}$ ozs. There was silicosis of the lungs with the formation of a small cavity. There was some cystitis of the urinary bladder. Both testes were fibrotic. Projecting from one side of the wall of the ileum about 9in. from the caecum, and not reaching its mesenteric attachment, was a walnut-sized mass consisting of a congeries of cystic cavities filled with straw-colored fluid. This mass projected from the serous aspect of the wall and caused slight puckering of the adjacent mucous membrane. Higher up was a slight pouch in the wall of the intestine, but not any cystic development. In the upper part of the ileum was a typical looking tuberculous ulcer with miliary tubercles on its serous aspect. Another smaller ulcer was

present several feet lower down, and still another at the entrance of the ileum into the caecum. Though the patient's blood pressure was only 100/40 and the blood urea nitrogen 16 mgrms., death was thought to be due to uraemia, from the failure of the polycystic kidneys to function normally, together with some toxic absorption from the cystitis and oedema of the lungs associated with the silicosis.

Comment.—The extreme cystic condition of these kidneys, though there was not much enlargement, seems to show that this is an example of the condition known as Congenital Polycystic Disease of these organs thought to originate in a developmental error, and in some cases as in this individual, only slowly increasing in size. With such congenital polycystic kidneys, a cystic condition in the liver is not uncommon. It was quite absent in this case. Rarely a cystic condition of the pancreas has been described—this was absent. Instead, we have a remarkable cystic mass the size of a walnut growing from the serous coat of the small intestine, presumably a condition analogous to the cystic developments occasionally met with in the liver and pancreas. Microscopic sections of the walls of the cystic cavities show that they have lost any epithelial lining they may have once had, but several of the small chambers had a lining of unstriated muscle. The tuberculous ulcer present in the intestine was an independent condition probably due to swallowing tubercle bacilli from secondary pulmonary tuberculosis developing from the silicosis.

In Guy's Hospital Reports (Vol. 76, Jan. 1926, p. 31) W. A. Sears has an interesting article entitled, "Congenital Cystic Disease of the Kidneys, Liver, and Pancreas," which should be consulted.

(6) OSTEOPHYTIC OUTGROWTHS ON THE RIBS—CANDLE GUTTERING OF THE RIBS.

(Reported by Professor J. B. Cleland, Honorary Pathologist.)

E. S., a widow, *æt.* 69, was admitted under Dr. Cowan on the 7th June. She said she had had diarrhoea for 12 months, from three to nine motions a day. She had pain in the stomach, an inflamed leg, and pains in her neck, right shoulder, knees, and elbows. She said she had had rheumatic fever at the age of 16, and scarlet fever at the same time. On examination she was restless, and gave irrelevant answers to questions. Her pulse was 130, regular. The thyroid gland was slightly enlarged. A systolic murmur was audible at the apex. She had varicose veins in her legs. The rest of the examination showed nothing abnormal save crepitations at the bases of both lungs posteriorly. On the 11th of June her temperature had risen to 103° F., and the signs at the bases of her lungs had become more numerous, and were indicative of pneumonia. On the 13th of June she died.

At the autopsy (No. 118/26) there was partial collapse of the lungs and slight hypostatic pneumonia. There was an old goitre. A large septic spleen, from which numerous colonies of streptococci were grown, was present. There were many polypi in the mucous membrane of the ileum. On the pleural aspect of most of the ribs near their vertebral ends were rough irregular, nodular, bony elevations, one about the size of a small marble, giving an appearance very like candle guttering. Microscopic sections showed a layer of irregular cartilage and bone, with a very cellular marrow.

V.—REVIEW OF VACCINE THERAPY AT THE ADELAIDE HOSPITAL FROM 1914 TO 1924.

[By DR. HELEN M. MAYO, Honorary Vaccinist.]

[This review forms part of a Thesis successfully submitted by Dr. Mayo to the University of Adelaide for the degree of Doctor of Medicine. Some minor alterations have been made, and the elimination of a number of charts and tables has been necessary to reduce expense.]

The review epitomises the experiences of Dr. Mayo as Bacteriologist in Charge of the Vaccine Department, now the Honorary Vaccinist, for a period of 11 years from 1914 to 1924. Dr. Mayo has gone carefully over the large number of cards dealing with the patients who received vaccine treatment, either Hospital patients or outside cases, and has summarised the results from two points of view. First of all the organisms met with in the various pathological conditions for which vaccines have been required are dealt with, and then in the second part the results of the vaccine treatment of the patients are considered. This work summarises the experiences of the Adelaide Hospital in Vaccine Therapy, and should prove valuable as a guide to members of the profession in Australia.—EDITORIAL COMMITTEE.]

RESPIRATORY INFECTIONS.

In the 11 years under review there were 306 vaccines made from nose and throat swabs, excluding the ozaena group, and 283 made from sputum.

The increasing demand for vaccines in this particular type of case is well shown; in 1914 four vaccines were made from naso-pharyngeal infections and 10 from sputum, while in 1924 there were 53 from the naso-pharynx and 50 from sputum.

In the earlier years 1914-1917 there was a lower incidence of Streptococci in the cases examined, and fewer vaccines containing these organisms were prepared. One might, perhaps, deduce from this that there has been an increased prevalence of streptococcal infections since the return of the overseas men and following the pandemic influenza of 1918. It is, however, difficult to know just how far the selection of cases affects the present series. In the earlier years, when fewer cases were examined, and the demand for streptococcal vaccine was less than nowadays, many cases may have remained unrecognised. Certainly in the years 1914-1920 the incidence of streptococci as revealed in these investigations was comparatively low in sputum cases—though in 1918 a rise occurred, to be followed in the next two years by a considerable fall. In the nose and throat affections, however, the 1918 rise was followed by a further increase in 1919, diminishing again in 1923, and followed by a great sweep upwards in 1924, coincident with the streptococcal rise. The aetiology of the common cold is still *sub judice*, though various organisms and a filtrable virus have been regarded as causal. In view of the good effect of vaccine treatment in some cases, it would seem that the organisms thus employed—as a rule streptococci—were at least a factor in their causation.

The history of nose and throat infections in the community corresponds, in that there has been a greater incidence of epidemic naso-pharyngeal infections since 1918. Evidence of this is not merely personal, but is based on the greatly increased demand for treatment of these conditions and their complications such as sinusitis, otitis media, mastoid disease, &c., as revealed by Hospital statistics. Lung infections follow more or less closely upon nose and throat infections, the organisms of the whole respiratory tract being similar and often identical.

The diseases for which these vaccines have been made comprise the common cold and most of the persistent affections of the respiratory tract, *e.g.*, sinusitis, rhinitis chronic and acute, atrophic rhinitis, otitis media, naso-pharyngitis, tonsillitis, laryngitis, bronchitis, bronchiolitis, bronchiectasis, interstitial pneumonia, lung abscess, infections of the pleura, persistent cough due to ill-defined causes, asthma, and pulmonary tuberculosis (associated organisms being used).

Naso-pharyngeal cultures have been examined also with a view to obtaining vaccines in cases of rheumatoid arthritis. Vaccines obtained from this source seem to be more satisfactory than those obtained from teeth in the treatment of this condition.

From a pathological point of view the above respiratory diseases have much in common. All are dependent upon catarrhal conditions of the mucous membrane lining the tract, the extent of the reaction and the ultimate changes in structure varying with the nature of the infecting organism or irritant, as the case may be, and the situation of the lesion.

Glancing over this list one sees that a large number of the conditions are caused by that very prevalent infection, or series of infections, the common cold. The affections caused by a severe cold comprise acute rhinitis, sinusitis (frontal, antral, sphenoidal), otitis media, mastoiditis, nasopharyngitis, laryngitis, tonsillitis, and may go on to bronchitis, interstitial or lobar pneumonia, &c. These, it is true, are not the necessary accompaniments of each case, but there are not wanting examples of all these types in any severe epidemic. The importance of this affection cannot therefore be overrated; it is a cause of widespread disability both temporary and permanent, and it affects every age and class. Any effective method of prevention should therefore be fully utilised.

If a census were taken of the community with regard to these infections it would be found that some fortunate members are more or less immune to colds. In a recent *British Medical Journal* the case of a family immune in this way was reported. The members were of good physique, with perfectly formed nares and sinuses, and had practically never suffered from these infections. This was ascribed to good nasal construction—perfect airway and drainage preventing the formation of any nidus of infection. It is highly probable that there was an additional immunological factor.

Of the people who take cold easily it may be said that they have either (1) a low resistance to infection, in which case a small dose of the offending organism will give rise to an attack, or (2) they possess a mucosa, which, owing to some chemical constitution or physical character of its secretion, allows the constant presence of pathogenic organisms on its surface, or (3) it may be that owing to the conformation of the nasal compartments there is stasis. In this last condition all may be well, until infection occurs, but then this stasis allows a more profound reaction to take place and prevents complete resolution so that there is always a mild chronic infective condition present, ready to light up whenever the general resistance is lowered.

It has been frequently remarked that after a holiday away from the city one's return is marked by a bad cold, suggesting that the usual organisms inhaled in one's daily round, when not sufficient to cause an infection exert an immunising effect—absence in the country in pure air seems to render the individual more vulnerable.

Still another cause of nasal disturbance is due to the inhalation of street or household dust, the pollens of various flowers and grasses,

and tobacco smoke. It is quite possible that the damage to the nasal mucosa by the mechanical or chemical action of these substances may be sufficient to allow the infective agent to gain an entrance.

In asthmatic patients it is often extremely difficult to say whether a given attack is entirely an allergic phenomenon, or is complicated by an infection—and one can regard any process that renders mucous membranes anaemic or hyperaemic and congested for a period, or that damages the surface in any other way, as leading to the possibility of infection that may in time cause a hypersensitivity to the organism concerned.

With regard to vaccine treatment, then, for the cure or prevention of colds. If the individual concerned belongs to the class with low resistance to infection, and if this low resistance be not due to poor hygiene and surroundings, or even if it is, it is quite conceivable that a vaccine of prevalent organisms, *i.e.*, a stock polyvalent vaccine, may have a very satisfactory effect in preventing the onset of such infections, though a change in occupation or environment and the correction of any other predisposing factors would also need to be considered.

Individuals of the second type may also be benefited by vaccine therapy in the same way, in that when resistance is raised to a specific organism, entrance to the body is less likely to be effected. As, however, these organisms live on the surface of the mucosa, they are not affected by the increased immunity, and may remain there in spite of treatment. This type may be called purely “carriers.” A number of doctors and nurses belong to this category.

There seems little doubt that some members of the third class in the community act as reservoirs of infection, and so act as a starting point for epidemics. Mrs. W. had four children, all delicate, pale, frequently ill, and constantly in attendance at the Out Patients’ Department. All were subject to respiratory infections. One had bronch-pneumonia with tonsillitis and the others had frequent colds, during the period in which they were under observation. The mother had a broken nose and suffered from chronic bronchitis. After failing to clear up the frequent and recurrent infections in the children it was decided to send the mother for nose and throat examination. Sinusitis was found, the nasal deformity having perpetuated the infection. Under treatment she recovered and there followed a great improvement in the health of the whole family, who are now seldom seen at the Out Patients’ Department.

Immunisation must occur in patients who recover from an infection though its duration is often short. It may be asked why a vaccine of the causal organism or its associates should give a more prolonged immunity than the attack itself. It is no doubt due to the fact that an immunity built up by regularly increasing doses is greater than that achieved by haphazard auto-inoculation. The immunity obtained by vaccines lasts a variable time, depending on several different factors—*e.g.*, dosage, infective agent, length of treatment, &c. Some people are kept well by a course of inoculations at yearly intervals, others have had a longer respite, a partial immunity in some cases extending over several years.

The question of the immunisation of school children against colds has lately been considered. This is likely to be useful on a large scale in boarding schools where supervision and control of administration are satisfactory, but less so in day schools where universal inoculation may not be feasible and where the tendency to introduce

new infections into the small community is less easily avoided. In the day schools, where this immunisation is probably more needed, it seems less likely to be practicable or effective.

An attempt was recently made here to immunise against colds the nurses in the Babies' Hospital, and a series of injections were given. No apparent improvement in the health of the nurses followed, and colds seem as prevalent as before. It may be that the dosage was inadequate or possibly that the infection increased in severity in its passage through the various inmates just as is seen experimentally when an organism is passed through a series of susceptible animals. It must, of course, be realised that immunity in these naso-pharyngeal infections is relative only, not in any sense of the term absolute, depending upon different factors. A person, for example, may be immune to certain catarrhal infections and yet fall a victim to others, or when the dose of the invader is large, or when the virulence of the organism increases. This holds good both as regards natural immunity and that acquired by means of vaccines.

In grouping the cases examined for respiratory infections one finds some 70 in number with atrophic rhinitis who were examined for ozaena bacilli (*B. ozaenae*, Abel).

The natural flora is of interest in that the production of an artificial one has been advocated in the treatment of this disease, *e.g.*, an attempt has been made to encourage the growth of staphylococci in the nasal mucous membrane by supplying a suitable medium for their growth. The incidence of infections due to *B. ozaenae* is said to depend upon an unduly large airway in a person predisposed by tuberculosis or syphilis to this affection. The nasal mucosa becomes atrophic, rendering the airway more patent, crusts form, and the discharge becomes purulent and extremely offensive owing to the growth of saprophytic bacteria. Various methods of treatment have been advocated—including surgical interference (aimed at lessening the airway by transplantation of cartilage), nasal douching, the production of the growth of symbiotic organisms, especially Staphylococci, and the administration of vaccines. There were 61 cases treated at the Adelaide Hospital Out Patients' Department by means of vaccine in the years under review. The vaccines used were *B. ozaenae* only in 32 cases, and in the remaining 29, *B. ozaenae* with staphylococci or diphtheroid bacilli, or *B. pyocyaneus* or streptococci. One case regarded as belonging to this category showed *Staphylococcus aureus* only on repeated examination of the nose, so that this was the vaccine administered.

These cases were given courses of treatment varying from a few weeks to one, two, or even three years, the injections being given weekly. The usual initial dose was 250 million *B. ozaenae* and the maximum 4,000 million. The greatest number of doses given was 157 and the least three, the average being 35. The notes here and there showed that some improvement was taking place, *e.g.*, "discharge less," "doing well," and so on, but on the whole there was little or none which could be directly attributed to the vaccine. Sometimes improvement at first was followed by a long period during which the injections brought forth little result. In looking over the series, definite improvement can be noted in about 10 cases only, and not in those which were given the longest course of treatment. This would suggest that the improvement was due to causes other than vaccine administration. The apparent failure in this class of case is not surprising when one considers the difficulty of affecting a saprophytic organism by the production of a raised general immunity.

That the consensus of opinion is against vaccine treatment in this condition is shown by the fact that nowadays practically no cases are treated in this way.

Recurrent tonsillitis has been treated with vaccines, and it is of interest to note that improvement has been found in these cases. The tendency to recurrence was lessened though not removed.

In considering the anatomical formation of the tonsil it must be realised that when once the crypts become the seat of pathogenic material it is unlikely that a raised immunity will cause a return to the normal functioning of the gland. It may, however, make systemic infection from the tonsils less likely, and does appear to render the attacks less frequent, so that in cases where the removal of tonsils is for any reason inadvisable the administration of a vaccine may be regarded as a useful adjunct to treatment.

It is good practice, also, in some cases to raise immunity to certain organisms before tonsillectomy in order to hasten convalescence after the operation.

In the affections of the upper respiratory tract which are included under "colds" and catarrh acute and chronic, it will be seen that vaccines, especially streptococcal vaccines, have an undoubted value. The evidence shows that in some cases they are curative and prophylactic, helping to clear up the attack and to prevent the occurrence of others for a more or less prolonged period. In other cases they often give rise to a considerable period of immunity after an attack. Such cases have been seen in the present series:—

Mr. B. had a course of some 12 injections of streptococci and pneumococci in a mixed vaccine. The initial dose was 10 million and the last 1,000 million. At the time of inoculation he was seemingly unimproved, but after a holiday and a period of non-smoking he was apparently cured, and has now been free from colds for three years. It may be thought that this immunity was due to the acute attack. This seems unlikely as he had not an acute condition, but merely a chronic pharyngitis and cough. He was subject, however, to severe recurrent colds, which since his inoculation have not returned.

Sister C. was a similar case, who seemed to derive little benefit from inoculations, but later developed immunity. She suffered from attacks of bronchitis which recurred every time she caught cold. She likewise had a course of mixed pneumococcal and streptococcal vaccine, and has remained well for the past 18 months.

The case of Dr. J. B. is of interest. He is a medical man with a large practice whose work was interrupted every three months or so by a severe cold which confined him to bed for days, and resulted in severe prostration. On more than one occasion haemoptysis occurred, and though no lung lesion could be demonstrated, grave fears of its presence were entertained. Autogenous vaccine was made containing streptococci and pneumococci and a course of inoculations was given. Rapid improvement followed, and each year since he has had a short series of injections, which have kept him free from attacks.

The two former, and other cases, have shown that in bronchitis and naso-pharyngeal affections associated with colds, vaccines may be of value even though this may not be apparent at the time of administration. The advantage derived depends upon the nature of the predominating and associated organisms and the absence of trauma, chemical, bio-chemical, or mechanical. Mechanical injury includes stasis due to faulty air passages, &c., as well as damage due to dust particles or smoke and anaemia or hyperaemia from any cause.

Chemical or bio-chemical includes the result of symbiosis with other organisms, the presence of pollens, &c.

In a given case it is not always possible to predict whether a vaccine will be of value, but if the trouble persists in the absence of mechanical disability and in spite of good hygiene, a vaccine of suitable organisms may have a dramatic effect.

Whooping cough vaccine has not been made at this laboratory, though stock vaccine has been used to some extent in the treatment of pertussis in children. The work was not sufficiently extensive to show clear-cut results. Children coming to the Out Patient's Department are apt to be irregular in attendance, and the mothers sometimes fear inoculations. The mistake made was in the small dosage, 100 million pertussis (Bordet Gengou) bacilli being the initial dose, doubling or the addition of 100 million being the method of increase. According to reports of this treatment, it is of little use unless some five times this dosage is used. The results were inconclusive when an attempt was made to assess them from the case records, though at the time the treatment seemed to be of benefit, in so far that mothers would come and ask for further dosage, saying the cough had been much relieved. It is possible, however, that had autogenous vaccines in large doses been given the results might have been more conclusive.

The treatment of bronchitis comes into this category. There may be a very large area of infected surface, and the symptoms vary with the degree of inflammation present and its exact position. The symptoms may be comparatively unimportant when the larger bronchi are involved, but in their ultimate ramifications, owing both to the effect of swelling of the mucosa and the presence of mucus causing obstruction, they may be serious. In acute capillary bronchitis the problem is largely mechanical as well as infective, and though vaccine may be useful, other measures are more important. In the more chronic types where the larger tubes are concerned, vaccine treatment has proved of great value in a number of cases—the chest signs clearing up, and the resulting cure being followed by a period of immunity. This has not been so in every case, and in one woman a supervening pregnancy seemed to be a factor in its recurrence. It is well recognised that where the bronchitis is secondary to heart affections or some other general condition, even immunisation to the infective organisms may have little effect on a residual congestive condition. In this, as in the other respiratory infections, vaccines containing streptococci with other associated organisms appear to be the most efficacious.

Bronchiectasis is a disease which one would not expect to benefit greatly by inoculation. In the first place it is due to failure on the mechanical side. There is weakening of the bronchial walls and increased intrapulmonary pressure due mainly to coughing. Some cases of a more localised type probably owe their origin to the presence of a foreign body, with the resultant irritation of surrounding parts and accompanying stasis. Other cases may be due to laryngeal stenosis with its resultant increased intra-pulmonary pressure. This increased pressure produces a more profound effect on bronchi whose walls are weakened either from congenital or inflammatory causes.

In spite of this very important mechanical element, there are cases which show very definite improvement from suitable vaccine treatment, in that the coughing is reduced, the sputum becomes less, and the feeling of wellbeing is increased. In this disease also, a streptococcal vaccine seems to have the greatest value and to give

the best results, whether given alone or in conjunction with other organisms.

Vaccine has been prepared by this laboratory for use in pneumonia, but, as might be expected, very little use is made of this form of treatment, for by the time the vaccine is ready the patient as a rule has no need of it. It seems questionable whether vaccine treatment in this disease would do good even if practicable. The stimulus to antibody formation being very considerable, one cannot see the rationale of the small added stimulus of a vaccine, and it certainly would not be desirable to give large doses.

Asthma, though closely associated with colds and bronchitis, stands apart on account of its presence in individuals who show an hereditary tendency to become hyper-sensitive to various substances, usually proteins. This hyper-sensitivity may also be shown by a tendency to develop hay fever or urticarial rashes. These unfortunate people may be hyper-sensitive to many types of protein occurring in animal or vegetable substances. Food ingested may cause reactions, but more especially minute quantities of substances inhaled (or injected). Among these substances are the pollens, household dust, feathers, hairs, &c. Horse serum injected subcutaneously or into the tissues may produce such a severe anaphylactic reaction as to cause death. Some of the pollens are spiky, and so exert an irritative mechanical effect, *e.g.*, the grasses. The hereditary factor seems to be the tendency to become hyper-sensitive; the actual substances which are the causative agents are variable and more or less accidental.

It is probable that asthmatics develop also a sensitivity to the streptococcus, probably owing to its virulence and its universal prevalence. This can be demonstrated in many cases by skin tests, and in some of these cases vaccine appears to have an excellent effect, the attacks decreasing in frequency and severity. Some patients seem to be actually cured, while others are relieved only or are not benefited at all. The same may be said of this as of the other respiratory infections—provided accessory troubles such as sinusitis, and mechanical defects such as nasal malformations, are dealt with, a vaccine of the organism to which the patient is sensitive will probably cause improvement.

The pollen treatment for asthma and hay fever is well known, and a combination of the two may be of great benefit.

Though vaccine treatment for urticaria cannot be said to be frequent, it has been used in this series, not so much for actual urticaria as for the impetiginous infection which complicates this trouble.

The results obtained by vaccine treatment in asthma and allied conditions are given in a later section.

INFECTIONS OF THE URINARY SYSTEM.

Infections of the urinary tract include pyelonephritis, pyelitis, cystitis, and urethritis as well as bacilluria. The organisms concerned show a great preponderance of coliform bacilli. This is in accord with the established bacteriology of the tract. The first paper on this subject was published in 1898, when Albaran, Halle, and Legrain gave an account of 304 cases in which the bacteriological findings were detailed. T. R. Brown quotes these results, and gives his own. The former found *B. coli* present in 42.7% of cases, in 20.2% in pure culture; the latter found *B. coli* 57.7%. Keyes in 1916 stated that he considered 90% of all kidney infections were due to *B. coli*.

In this series of cases, 493 in number, 79.9%, or 379 cases, showed coliform bacilli present, 70.10% (346 cases) in pure culture.

In the earlier years the number of Gram negative bacilli reported was high, and coliform bacilli low, in marked contrast to the later years. This probably means that a number of Gram negative bacilli in the earlier years really belonged to the coliform group, but were not fully identified, and would have raised the figures for coliform bacilli still higher had they been differentiated.

It is a matter of interest that while the *B. coli* remains in its natural habitat it causes no rise in agglutinins, but when it becomes parenteral, as in urinary tract infections, the immunological reaction becomes demonstrable. This suggests that vaccine therapy in these infections is a reasonable method of treatment, aiding what appears to be the natural process of recovery.

Summary of Urinary Infections, 1914-1925.—Coliform bacilli, 346; "Gram negative bacilli," 36; staphylococci, 33; streptococci, 7; enterococci, 3; *B. pyocyaneus*, 1; *B. proteus*, 1; other organisms, 7; mixed organisms, 59. Total, 493.

In practice vaccines have been given in pyelitis and in cystitis with varying results. Thomson Walker states that vaccine treatment is of value in some cases, but stresses the fact that it is difficult to predict the particular cases in which it is likely to be so. There is certainly no doubt that vaccines have been given frequently without good results.

In considering the indications for treatment the anatomy of the urinary tract, with special reference to its mechanical arrangement, must be borne in mind.

The kidney pelvis normally is drained by ureters which allow the urine to escape into the bladder at frequent intervals. After the bladder reaches a certain degree of distension it is emptied, and so the process goes on. Calculi in the renal pelvis may block some of the calyces and cause both irritation and stasis. If there is added to this condition an infection, it is unlikely to disappear without removal of the calculus. Calculi may block also the exit to the ureter or the valve-like opening into the bladder. This block may be partial, complete, or ball-valve in type. Then again the ureter may be kinked by faulty position of the kidney, an aberrant renal artery, by masses in the abdomen, neoplastic tumors, or otherwise, or may be partially obstructed by a pregnant uterus. This can be demonstrated by pyelography and X-ray examinations. When such a mechanical defect is present there may be no very apparent serious consequence until infection occurs, in which case the abnormality becomes a serious bar to recovery. Similarly with regard to the bladder, imperfect emptying, whether due to cystocele in women or to enlarged prostate or stricture in men, complicates the problem of infection, as does also the damage caused by calculus or other foreign body. In addition, the virulence of the organism and the general state of the patient, his age, the condition of his vascular system, and, in fact, his general resistance, must be taken into consideration.

Where the mechanics are satisfactory and the general health fair, probably simple measures such as alkalinisation of the urine, rest, etc., are quite sufficient to effect a cure. On the other hand, where a serious interference with normal drainage occurs, the usual treatment is not successful or only temporarily so, and the infection remains or subsides for a time, only to recur again later.

Between these two extremes, however, there must be a number of patients with slight mechanical defect who can respond, if to alkalinisation can be added another favorable factor, such as an increased specific immunity. Hence an individual with low immunological response, or when the organism has greater defensive powers,

or higher virulence, may be helped, by the administration of a specific antigen.

It must be remembered that another reason for failure to recover is the occurrence of mixed infections, each organism making the conditions more favorable for the growth of the other.

In renal infections with pyuria it is essential to be certain that the tubercle bacillus is not present. Any cases of persistent pyuria, especially if due to staphylococci, should be investigated by means of appropriate laboratory examinations for the presence of the tubercle bacillus, which in a mixed infection is likely to be overlooked.

In the cases of urinary disease in which vaccines have been given, complete investigations have not always been possible, and so the causes of failure remain unknown. In some cases the patients were old, with sacculations of the bladder which made complete emptying impossible. In others tubercle bacilli were subsequently found, while in others again, calculi or foreign bodies, such as a hair-pin, were proved to be the cause of the persistent infection, which cleared up on their removal. In still other cases no such explanation was forthcoming, and one is compelled to fall back upon the supposition that there must have been some obstacle to recovery either in the local conditions or in general resistance.

In addition to all these factors it is certain that in some cases at least, the dosage was inadequate either in the amount or the number of inoculations given. In the earlier years, extreme caution was observed with regard to the size of the dose employed all through the course. Now the initial doses are even smaller, but a very much more rapid increase is made in each successive dose, the results seeming, however, to justify the method.

One child, aged four years, had a persistent urinary infection characterised by pyuria and repeated attacks of fever, accompanied by strangury and increased frequency. Repeated admission to Hospital and care at the Out Patients' Department failed to control the attacks until an autogenous *B. coli* vaccine was administered. She was given frequent and rapidly increasing doses until 300 million was reached. Great improvement followed, for though there was still slight pyuria there was almost complete cessation of the febrile attacks. There can be little doubt that in this case there existed some mechanical fault which was responsible both for the acute attacks and the persistence of the infection.

ARTHRITIC INFECTIONS.

CULTURES FROM MOUTH AND TEETH.

Vaccines have been prepared from cultures taken from mouth and teeth and tooth sockets for the treatment of local lesions such as persistent ulceration of the mouth—pyorrhoea, alveolaris, and allied conditions—but the great majority have been made for the treatment of arthritis. The use of vaccines in certain types of arthritis has been largely employed in the belief that the septic focus in mouth, teeth, or tonsil was responsible in part, at all events, for the joint condition. In recent years there has been a tendency to get the streptococcus, if possible, from the nasopharynx, rather than from the teeth, in the treatment of arthritic infections. With regard to ulcers in the mouth a few cases were treated without obvious benefit. One patient showed a crop of aphthous ulcers which appeared in the mouth in response apparently to some worry. She was given an autogenous vaccine of streptococci for a prolonged period without improvement. The condition, which is not very common, has been attributed to some nervous influence. The cases of pyorrhoea which were treated

were found to improve when local treatment also was instituted, showing that a vaccine in itself, though possibly helpful, was inadequate. This is as one would expect, pus pockets and tartar producing just these conditions of poor drainage and foreign body irritation which favor the persistence of an infection.

In these cases, streptococci have been the organisms most commonly found and used in the vaccine preparation, so much so that two vaccines only were made of organisms other than these. The great rise in the incidence of these organisms in this group corresponds closely with that found also in the nasopharyngeal infections, and no doubt is due to similar influences.

For the purpose of this investigation arthritis may be divided into two classes:—(1) Infective, (2) Metabolic in origin.

1. *Infective Arthritis*.—Under this heading are included those conditions in which known organisms are present, *e.g.*, gonococcus, pneumococcus, streptococcus, &c. Infections such as tuberculosis and syphilis also belong to this category, though they are not dealt with in the present section. Tuberculosis is included in the section on tuberculin, and syphilis, not being treated by vaccines, is excluded. In this group are also various types of arthritis which, though not proved to be due to a specific organism, are no doubt either caused or at least intensified by some infective focus or foci in the body. Such cases may be associated with infected teeth or tonsils, or fellow absorption from a large infected area of the respiratory tract as in chronic bronchitis. Such foci may also be located in the gastrointestinal tract, *e.g.*, in gall bladder or intestine, or in the genitourinary system. The presence of such a focus, whatever its situation, seems to be a potent factor in influencing these joint conditions. Infective arthritis may be acute or chronic, and may present changes in the joints ranging from a simple synovitis which clears up leaving no disability, to the chronically enlarged, deformed, and immobile joints which show gross pathological changes on X-ray examination.

The cases may be further divided into purulent and non-purulent varieties. In the latter the synovial membrane is congested, and the articular cartilages become covered with a fibrinous exudate, while clear or slightly turbid fluid fills or distends the joint cavity. Resolution may occur at this stage or the process may go on to suppuration. Non-suppurative arthritis may occur even in infections due to pyogenic organisms, but more usually these organisms cause suppuration.

Purulent arthritis may occur as a sequel to a non-purulent infection as mentioned above, or as part of a pyæmic process, or it may occur in the special infections such as scarlet fever, typhoid, pneumonia, etc. Though the tendency in these latter conditions is towards pus formation, this is not an invariable accompaniment.

In gonorrhoeal arthritis there may be extreme damage to the joint constituents, the cavity may fill with serous fluid or pus, and the resulting deformity may be great. The large swelling of the joint and surrounding tissues is a feature of this disease. The larger joints are commonly affected, especially the knees.

2. *Non-infective Types*.—Under this heading are described two main types, the degenerative and proliferative. The changes occurring in the joints in these conditions differ from each other, but are in each case profound, leading to destruction of the cartilages, eburnation or grooving of the bone with proliferation and lipping of the edges on the one hand, and absorption of bone on the other. Finally, ankylosis and complete disorganisation of the joint follows with loss of function.

Though this type of arthritis may be influenced by septic foci in the body, repeated attempts have failed to prove the condition infective, so that the general trend of opinion is to regard it as being of metabolic origin.

With regard to the vaccine treatment of these conditions, it is obvious that in cases in which there has been extensive tissue damage, little can be expected in the way of recovery. In certain cases in which the joints, though damaged, are the seat of recurrent low-grade inflammatory processes associated with pain, it is possible that a vaccine which helps to combat such processes may be useful. It appears also that in immobile limbs where the normal vascular stimulus caused by muscular action is absent, that the hyperaemia caused by protein shock therapy may be of benefit, at all events in relieving some of the symptoms. It is difficult otherwise to explain the apparently favorable influence exerted by this treatment on some of the more serious joint affections.

In the case of infective joint conditions the outlook is more hopeful; both subcutaneous specific, and intravenous non-specific inoculations are of considerable benefit. Relief from pain and stiffness are quite usual results following the second or third injection.

In gonococcal arthritis stock vaccine is used almost invariably, the difficulties encountered in the growing of the gonococcus making autogenous vaccination impracticable. This affection of the joints, in the present series, followed the primary urethral infection in some cases almost immediately, and in others after the lapse of years. It is, however, always difficult in these cases to get a clear history, and one may be misled as to the duration of the disease. The knees were the joints most frequently affected, the heels and ankles were often involved, and the other joints to a less extent. There were a number of acute cases where fever was present and a small dose of vaccine was deemed advisable.

The rule was to give an initial dose of one million and double each time if a reaction did not occur. In subacute cases five million, and in chronic cases 10 million, was the initial dose.

This vaccine appeared in many cases to be helpful, especially when the higher dosage was reached. The course was considered to be complete with the dose of 1,000 million, though in some cases further treatment was necessary. Intravenous *B. coli* injections were given in a number of cases.

Though the vaccine was of value it did not prevent the recurrence of the arthritis in some cases, and in others the pain and swelling were still present, in some degree, at the end of the course. The treatment is not persisted in when the results do not seem to justify the expenditure on the part of the Hospital. There are, however, a few patients who have remained well for years after their course of injections, the good result being no doubt in part due to the vaccine.

SUPPURATIVE CONDITIONS.

(a) CARBUNCLES, BOILS, PUSTULES, FURUNCULOSIS.

(b) SUPPURATIONS UNCLASSIFIED.

Carbuncles, boils, pustules, and furunculosis form a large group of cases for which vaccine treatment has been used. The chief aetiological organism is the *Staphylococcus pyogenes aureus*. There has been an increasing demand for vaccines in this type of case. Such an increased demand might mean either the occurrence of a greater number

of cases in the community, or a growing recognition of the value of vaccines in these conditions.

The organisms that have been found in addition to the *Staphylococcus aureus*, include *Staphylococcus albus* and undifferentiated staphylococci, streptococci occasionally, and also mixed organisms.

The dosages of *Staphylococcus aureus* vaccines as given here differ somewhat from those of the Commonwealth Serum Laboratory, which recommends as a suitable initial dose for an adult 200 millions, the increment being 100-400 and the maximum 1,000-2,000 millions. Here the initial dose is, as a rule, 250 millions, the increase 250 millions twice weekly up to 1,000 millions, then once a week increasing by the same amount up to 5,000 millions if required. Such large doses are by no means always used, but in some obstinate and recurrent cases this method has proved beneficial.

There are always a certain number of cases which do not recover owing to some fault in general hygiene, or to some special factor, not always easy to detect or to remedy.

For instance, persistent and recurrent boils are not infrequent in people who live in some parts of the country where, owing to lack of water, fresh fruits and green vegetables are not easily obtained, and frequent bathing and washing impossible, so that in addition to food deficiency there is defective hygiene. In these cases the raising of immunity by vaccine treatment cannot be expected to effect a cure.

Other resistant cases are those in which there is a persistent local occurrence of the boils, *e.g.*, a case of recurrent boils on the vulva with an eczematous skin condition causing irritation. Improvement followed immunisation, but the eczematous condition did not clear up entirely—with continued scratching and damage to the skin fresh opportunities for deeper staphylococcal invasion occurred. A few doses of X-rays cleared up the eczema, and several years later the boils had not recurred. The vaccine probably played a part in producing this result.

A somewhat similar case may be quoted in which several prolonged courses of *Staphylococcus aureus* vaccine were given to Sister S. Her hands were eczematous and she suffered from frequent boils. For some years inoculation afforded her considerable relief, but later no amount of immunisation was effective, in spite of freshly-prepared vaccines and high dosage. After a month's vacation she was well, but her trouble recurred directly she began work again, and had her hands constantly wet. Finally she was obliged to take up other employment.

In all these cases it will have been noted that infection was complicated by some other factor.

Other resistant cases are those with some defect of carbohydrate metabolism, with or without a slight rise in blood sugar. Such cases may do well when the carbohydrate intake is limited.

At the Babies' Hospital boils are a constant cause of trouble, not only to the patients themselves, but also to the nurses. The babies are usually delicate, and heat and moisture, combined with lowered resistance and the presence of the infective organisms, are sufficient to explain the prevalence of the condition.

Colloidal manganese has been used with good results, but wherever it has not been entirely effective it has been followed by a course of autogenous or stock vaccine. Surgical interference is practically always required. Since the nurses's hands are usually involved the infection is probably the result of direct inoculation. No attempt

at prevention by means of a prophylactic course of vaccine treatment has as yet been tried.

Suppuration Unclassified.—In this group the material submitted for the preparation of the vaccine was, in many instances, from a suppurative condition which was unspecified—the specimen being marked “pus.” For convenience a few miscellaneous conditions have been included in this subdivision, *e.g.*, pus from cerebral, appendicular, and perineal abscesses, from suppurative joint conditions, and in one instance from the pleural cavity. In the latter, pneumococci were present in pure culture. In the cultures from the perineal and appendicular abscesses coliform bacilli were present, so that, as one would expect, the bacterial flora was influenced by the situation of the lesion.

WOUND AND SINUS INFECTIONS.

Wound and Sinus Infections.—These cases, as would be expected, show a great variation in the type or types of organisms present. Staphylococci, streptococci, and mixed organisms are the usual types; the *Staphylococcus aureus* shows the highest incidence in recent years, especially in 1921.

SKIN LESIONS.

(a) ECZEMA, IMPETIGO, AND INFECTIVE RASHES.

In the group including *skin lesions, eczema, impetigo, and infective rashes* there were not a great number of cases, 12 in 1924 being the highest. *Staphylococcus aureus* is again the organism most frequently found. Several streptococcal infections are recorded, some of them haemolytic, as in one or two cases of impetigo contagiosa, where they were present in association with the *Staphylococcus aureus*.

(b) ACNE.

Acne has been classified separately, for although a skin lesion and associated with suppuration, it runs a different course, the results of vaccine treatment are not the same, and the infecting organisms are different.

In the earlier years the *Staphylococcus aureus* was apparently the chief aetiological factor, whilst in later years, 1920-1925, the *Staphylococcus albus* has occupied this place. Acne bacilli have been found, but not in all cases. In recent years all patients suffering from this infection have been inoculated with a mixed vaccine of stock or autogenous acne bacillus and autogenous staphylococcus.

Acne is a chronic affection which does not tend to recover with vaccine therapy in the absence of local treatment. Measures directed towards the removal of retained secretions and the production of hyperaemia are in themselves beneficial.

The results of vaccine treatment are dealt with in a later section.

BLOOD INFECTIONS.

Blood cultures from cases of septicaemia and pyaemia of purperal origin and from cases of subacute or malignant endocarditis show the *Streptococcus* as the most frequent infecting organism. It was present in 30 cases in pure culture. Two cases showed *Staphylococcus aureus*, and one a Gram negative coccus.

It is notoriously difficult to obtain a pure culture in taking a blood specimen, so that when *Staphylococcus aureus* or *albus* is obtained, or Gram negative cocci, it is usual to regard these organisms as contaminations from the skin unless their identity as the infecting organism is confirmed from other data or by repeated blood cultures.

On one occasion in the present series (an atypical case which was diagnosed clinically as infective endocarditis) *B. typhosus* was recovered from the blood, thus establishing the diagnosis and rendering vaccine treatment unnecessary.

Thirty-three vaccines were prepared during the period under review, of which 30 were streptococcal. The results in those cases which could be verified are given later; they are almost uniformly bad.

UTERINE, CERVICAL, AND VAGINAL INFECTIONS.

The organisms found in this series, as might indeed be expected, show very little constancy.

The conditions for which vaccines were required varied from puerperal infection to chronic endo-cervicitis, and the flora in these conditions is not by any means identical. Most of the cases were sent by private practitioners, and the methods used to obtain the smears, in cases of endo-cervicitis especially, were probably open to criticism.

Many such cases are gonorrhoeal in origin, and the organisms grown from cervical smears, though complicating the lesion, are not necessarily the chief aetiological agents; moreover, the condition is further complicated by questions of local drainage and irritation. Hence in cases of endo-cervicitis secondary to gonorrhoeal infection no very good result can be expected in the absence of local treatment.

Other cases of endocervicitis follow on puerperal damage and infection, often perpetuated by uterine displacement, prolapse, &c., and hence a resultant stasis from interference with the ordinary vascular supply. It is quite possible that when repairs have been effected, vaccine treatment might be helpful, but it has seldom been used.

With endocervicitis the results would be more trustworthy if a number of cases of known pathology were observed and treated along definite lines. This, however, has not been possible, and the findings cannot be regarded as of much value.

In uterine infections of puerperal origin the observation has been made that in cases where the patient lived long enough to have several doses of vaccine, definite benefit was obtained. This has been so, not only in Hospital cases, but also in cases under the care of private practitioners. On the other hand, however, cases have occurred in which the administration of vaccine has appeared, if not actually to cause the death of the patient, at least to have hastened it.

The routine followed in the Hospital is the administration of stock streptococcal vaccine until the autogenous vaccine is available. Minute doses—one-quarter to one-half a million—are given at first, and if a reaction does not occur the dose is gradually increased, careful watch being kept for any bad effect. It is recognised that in order to effect tolerance for a larger dose which may have a therapeutic value it is essential to proceed slowly, and thus avoid actual harm.

It is difficult to assess the therapeutic value of the treatment, as in such crises every agent likely to be of value is used, and the result may be due to one or all of the measures taken. Those who have given these inoculations in a number of cases, using small initial dosage, are convinced that they are helpful.

In puerperal sepsis we are faced with the same problem of drainage of the infected material, and it is conceivable that in cases where infection has occurred, but is not continuous, and where the immunity mechanism is neither completely overwhelmed nor stimulated up to its full capacity, a steadily increasing dose of the specific antigen may help to rout the invader.

Cultures from vaginal secretion are regarded as of little value, since the organisms are too varied to ensure the isolation of a given pathogenic agent.

EYE INFECTIONS.

A number of cases of eye disease have been treated in this department during the period under review.

Styes have been included under pustules, boils, and carbuncles. It may be mentioned, however, that the causal organism, in nearly every case, was the *Staphylococcus aureus*, and that the results were good, provided a sufficient number of doses was given.

Corneal ulcer has been treated by vaccine in a number of cases. Four of these are recorded; in two pneumococci were present in pure culture, and in two *Staphylococcus aureus*; in one case in each of these infections improvement took place, but not in the others. A fifth case is recorded as showing improvement, but incomplete notes do not disclose either the dosage or the organism concerned.

Autogenous *Staphylococcus aureus* vaccine was given in a case of *Staphyloma* and one of pustular *Blepharitis* without improvement. In the latter case subsequent treatment with Old Tuberculin gave a very satisfactory result.

Eighteen other cases are recorded as having been treated by tuberculin, one with the Beraneck preparation and the others with Old Tuberculin. This group includes seven cases of *Trachoma*, one of *Dacryocystitis*, two of *Iritis*, two of *Granular conjunctivitis*; the remaining six were chronic eye conditions unspecified in the case notes. The number of doses varied from eight to 27, the minimum dose was 1/500mg., the lowest maximum dose 1/40mg., and the highest 20mg. As to the results of these injections, seven are reported as quite well, eight as much improved, two as better, and one as "sight better." This treatment, then, in non-tuberculous, as well as in tuberculous eye diseases as has long been recognised, is a therapeutic agent of great value.

In a number of cases the eyes were bacteriologically examined prior to cataract extraction, and vaccines were given in order to raise immunity. The efficacy of this method is not obvious from the records, though even if these were complete it would be difficult to determine the part played by factors other than the vaccine administration.

The total number of vaccines prepared during the years 1914-1925 was 17, with a maximum in 1918. Four were of *Staphylococcus aureus*, two of streptococci, five pneumococci, one diplococci, one coliform bacilli, and four of mixed organisms, in one of which the xerosis bacillus was present, and in three of the others *B. pyocyaneus*.

Apart from the successful vaccine treatment of styes, and good results obtained from tuberculin treatment, the present series is too short to permit of generalisations.

SUMMARY.

Taking all the foregoing conditions as a whole, the number of autogenous vaccines made number 2,074. The following table shows the number and percentage of vaccines made in the various groups under review:—

Infection.	Number of Vaccines Made.	Percentage.
Urinary	493	23·7
Suppurative—Boils, Carbuncles, Furunculosis..	323	15·5
Respiratory—Nasopharyngeal	306	14·7
Sputum	283	13·6
Suppurative—Unclassified	178	8·5
Acne	113	5·4
Mouth and Teeth—Arthritic	99	4·7
Ozaena	87	4·1
Wound and Sinus	68	3·2
Uterine and Vaginal.....	41	1·9
Skin—Eczema and Infective Rashes.....	33	1·5
Blood Infections	33	1·5
Eye Infections	17	0·8
Total	2,074	

If respiratory infections were taken as a whole instead of being subdivided, as in the above table, they would number 589 or 28.3 per cent., and so head the list. Likewise suppurations if undifferentiated would represent a much larger proportion of cases. This table, however, is of interest in that it gives an idea of the relative demand for vaccine treatment in the different classes of infection.

TUBERCULIN THERAPY.

Old Tuberculin has been principally employed for therapeutic purposes, the initial dose in many cases being 1/10,000,000th mg., and from this the dosage has been gradually increased. Occasionally Dreyer's Vaccine Bacillary Emulsion, or Beraneck's Tuberculin has been given. No accurate data have been collected, but the general impression has not been sufficiently favorable to make a routine change from old tuberculin desirable.

The practice of giving tuberculin to produce anaphylactic shock in chronic local inflammation has been fairly extensively followed in the Eye Department. Cases of trachoma, corneal ulceration, iritis, keratitis, and blepharitis have been treated with excellent results. A case of pustular blepharitis, for example, did not respond to an autogenous staphylococcal vaccine, but cleared up rapidly on the subsequent use of tuberculin. It is quite conceivable, of course, that the excellence of the result was due to a combined effect, but the fact remains that little improvement followed the specific inoculation until the non-specific treatment was instituted. The rationale of the treatment appears to be based on the fact that universal hypersensitiveness to the tubercle bacillus makes an anaphylactic shock possible.

The conditions for which tuberculin therapy is used include pulmonary tuberculosis, tuberculosis of bones (including the spine and psoas abscess) and of joints, tuberculosis of the genito-urinary system, tuberculous peritonitis, glandular tuberculosis, and tuberculous conditions of the eyes and skin.

The cases of pulmonary tuberculosis treated in the public hospital are not many, as this institution is regarded merely as an intermediate step between the Sanatorium and Consumptive Home. Therefore no organised plan of classification has been attempted. The difficulties of such a classification have been summarised by Turban, who points out that the physical signs may not convey a true idea of the pathological lesion, that various observers interpret signs differently, and that signs alone without careful consideration of history, &c., do not afford a sufficient basis for prognosis.

In the series of cases here considered the effect of treatment is summed up in one word—"improved" or "unimproved." Such results, while not of great consequence, may be regarded as indications, however slight, of some therapeutic effect, and if the greater number of cases show improvement—as they do—then at least the effect is in the right direction.

In the early years of the work a number of cases of pulmonary tuberculosis were treated by the administration of mixed vaccines of associated organisms found in the sputum. The method was a peculiarly haphazard one; large doses of an unselected mixed vaccine were given at frequent intervals. The medical man who in particular used this treatment, was favorably impressed by the results. It is known, however, that most of the patients died within a few years, and probably the benefit derived may be attributed to his optimistic attitude.

Tuberculosis of the Bladder and Kidneys.—Where one kidney only is affected, the proper treatment is to remove it after ascertaining the efficiency of the other, by appropriate methods. Post-operative tuberculin treatment is of value. There may be some other tuberculous

lesion in the body, hidden or otherwise. When both kidneys, kidney and bladder, or bladder alone are affected, tuberculin treatment is desirable, and appears to give excellent results. In cases of bladder tuberculosis the dysuria is often extreme, and patients regard the treatment as very helpful. This is shown by the fact that they come for treatment for a long time, even years, and are very grateful for the relief afforded.

Improvement of symptoms and even healing of the lesion does not necessarily mean entire eradication of the infection, and a number of cases apparently cured of urinary tuberculosis have subsequently developed a pulmonary or spinal lesion. This may, of course, occur after recovery from a tuberculous lesion, whatever the treatment; nevertheless it demonstrates the fact that the administration of tuberculin, even when successful, does not prevent the subsequent development of activity in the same or another focus.

Cases of Tuberculosis of Bones and Joints and of Glandular Tuberculosis may derive great benefit from the administration of tuberculin, and it is believed that sometimes by this treatment surgical treatment may be rendered unnecessary.

Tuberculosis of the Skin is infrequent in this country, and there have not been many cases recorded. Improvement has followed in some.

The use of tuberculin in chronic non-tuberculous eye conditions has been mentioned, and it has occasionally been used in tuberculous eye lesions. These cases are comparatively uncommon, but are known to be benefited by this form of treatment.

THE RESULTS OF TREATMENT BY VACCINES AS SHOWN IN AN ANALYSIS OF 1,083 CASE RECORDS.

The data contained in this section was gathered from the analysis of 1,083 case records. For reasons such as insufficient notes, contradictory statements as to results, too short a course of treatment, death before vaccine administration, &c., some 200 cases have been excluded, the final number from which conclusions are drawn being 806. These records have been obtained from three main sources:—

- (1) Adelaide Hospital case books.
- (2) Vaccine cards of Adelaide Hospital patients.
- (3) Reports from practitioners who have used vaccines in the treatment of their own cases.

With regard to the case books, the information concerning results of vaccine administration is on the whole scanty and often absent, so that these cases form a large fraction of those discarded. The vaccine cards are kept at the Hospital for the purpose of recording dosage and results obtained in the treatment of both indoor and out patients, and as Clinical Bacteriologist to the Vaccine Department one has had the opportunity of personally commenting on the majority of the cases and of ordering the required dosage. Hence it follows that these records have supplied most of the present data. Reports, as to results of treatment, sent by private practitioners who have used autogenous vaccines supplied by the Laboratory, have been utilised. These form a small number of the cases recorded in the present series.

It will be apparent that these statistics are influenced by various factors, and serve to indicate the trend of opinion as to the success or otherwise encountered in the various classes of disease treated, rather than to establish dogmatic principles.

Vaccine therapy is as a rule used in conjunction with other forms of treatment and controls are more or less impracticable, so that even

if these were our only difficulties, the findings would have to be regarded in the light of a clinical, and thus empirical, investigation in nowise pertaining to a clear-cut scientific experiment.

Bearing these facts in mind we can now come to a consideration of the results of vaccine treatment as evidenced in the present series.

DISEASES OF THE RESPIRATORY SYSTEM.

ANALYSIS OF RESULTS IN CASES TREATED BY VACCINE.

Respiratory Infections.—The results of treatment in 193 cases of respiratory infections have been tabulated as follows:—

Nature of Complaint.	Cured.	Improved.	Not Improved.	Died.	Total.
Colds and their Sequelae in Upper Respiratory Tract	9 or 21·42%	22 or 52·37%	11 or 26·19%	—	42
Infections due to <i>B. ozaenae</i> (Atrophic Rhinitis)	1 or 1·64%	9 or 14·75%	51 or 83·6%	—	61
Bronchitis.....	8 or 34·78%	11 or 47·82%	4 or 17·39%	—	23
Bronchiectasis.....	1 or 11·11%	5 or 55·55%	3 or 33·33%	—	9
Asthma.....	7 or 14·28%	27 or 55·09%	15 or 30·51%	—	49
Miscellaneous—Lung Abscess, Empyema, Pneumonia, unspecified	—	2	2	5	9
Respiratory Lesions as a whole	26 or 13·47%	76 or 39·37%	86 or 44·55%	5 or 2·59%	193

Colds and Their Sequelae.—Forty-two cases are included in this subdivision, which shows 21·42% successes and 26·19% non-successes, whilst the intermediate group of improved cases comprises 52·37%.

The usual number of injections was 12, though as few as six and as many as 30 were given in some of the cases that showed improvement. All except two of the vaccines in this group contained streptococci; in the others Friedlander's bacillus and pneumococci respectively were the organisms used.

With regard to dosage, the highest maximum dose of mixed streptococcal vaccine given was 7,000 millions, the lowest maximum dose 320 millions.

Immunity to colds following inoculation is very variable. In 14 cases it was recorded as extending from eight months to three years. This immunity was relative, as in some cases occasional slight colds were mentioned.

In the 11 unsuccessful cases the vaccine used contained streptococci in seven, and in the remaining four *Bacillus pyocyaneus*, *Staphylococcus aureus*, *Staphylococcus citreus*, and Hoffman's bacillus respectively.

The conditions for which these vaccines were administered were, in six cases, persistent and serious infections of the nasal accessory sinuses which had proved intractable to other forms of treatment. One died after seven doses of vaccine, from so-called frontal sinusitis, and in another case there was extensive involvement of the less accessible nasal compartments. Of the others, a child with infected tonsils and adenoids obtained no benefit, and two more after four or five doses were not improved. There was no indication in the other cases as to the cause of failure.

Speaking generally, the causes of failure appear to be:—

- (1) Unsuitability of the cases selected.
- (2) Presence of mechanical faults requiring surgical interference.
- (3) Improper dosage—

- (a) Too large initial or too small final doses, too few injections for the production of sufficient immune bodies.
- (b) Organisms which were of no value in the condition under treatment.

Vaccine therapy appears to be of distinct value in the treatment of recurrent persistent colds and their sequelae. The benefit obtained is prophylactic as well as curative. The above percentages give a very fair idea of the results to be expected from vaccine treatment in this type of case. There are always a few cases that do not respond, but these should become fewer when the causes of failure are more widely recognised. Sufficient dosage is important and subsequent immunisation at intervals is advisable to protect susceptible individuals.

In *Atrophic Rhinitis* or infections due to *B. ozaenae* the conclusions as to treatment have already been given. It is obvious from the 83.6 per cent. of failures that vaccine therapy has very little influence in this condition, though a temporary improvement was apparent in several cases.

Bronchitis.—Cases in this group show a somewhat similar type of result to those included under colds and their sequelae, but with an increased percentage of cures. The figures show cures 34.78%, failures 17.39%, and improved cases 47.82%. Differences in percentage of such extent count for little in small groups of cases, and the similarities are greater than the differences.

Two cases are included which improved after nasal operation, and had a subsequent immunity lasting over a long period. In all, four cases showed a definite increased immunity to subsequent attacks.

Of the four failures the basal condition in one was a tuberculous pulmonary lesion—in another the dosage was probably inadequate. There is no specified reason to account for the failure of the other two.

Among the cases that showed improvement two call for special comment. One had Hodgkin's disease and subsequently died of it; the other had a recurrence of bronchitis on becoming pregnant. In both cases it is obvious that a raised specific immunity was not sufficient to overcome extraneous disabilities.

In bronchitis, which is often secondary to a naso-pharyngeal infection, perpetuated, possibly, by mechanical nasal defect, the results are likely to be influenced by the same factors as have already been mentioned in connection with colds and their sequelae.

All the vaccines given contained streptococci—the highest maximum dose was 4,250 millions mixed vaccine, the lowest maximum dose was 85 millions. The number of doses varied from seven to 34, with 12 as an average.

Where discrimination was used in the selection of cases, where remedial surgical treatment when necessary and possible was used, and where adequate dosage was administered, the results were encouraging, and show that vaccine treatment is of value in cases of persistent and recurring bronchitis.

Bronchiectasis.—Nine cases appear in this series—a number too small to form a basis for generalisation.

One cure is recorded, but when the pathology of the condition is considered, one can only question either the diagnosis or the result. Improvement is recorded in five cases, the sputum and cough diminished and weight increased, and liability to recurrent exacerbations lessened. The doses given were many and eventually large—streptococci were present in each vaccine—except one, which was

pneumococcal. 160 doses were given in one case which improved, 153 in another. The largest maximum dose was 3,400 millions, the smallest maximum dose was 150 millions of a streptococcal vaccine.

Of those that failed to respond, one had nine doses of a pneumococcal vaccine with a maximum dose of 40 millions; another was a child of 12 whose symptoms dated from babyhood—36 doses were administered with a maximum dose of 1,000 million mixed streptococcal vaccine. The conclusion drawn is that vaccine treatment is worthy of a trial, but any profound or dramatic change is not to be expected.

Asthma.—In this series of cases, seven are recorded as cured, viz., 14.28%; 15 failed to benefit, 30.51%; and 27, or 58.09% were improved. Of those who showed improvement 12, or 24.49%, are recorded as showing very definite improvement, while in six cases, 12.24%, it is stated that recurrence took place. This latter is no doubt an under statement, for it is probable that recurrence took place in all who were not cured, *i.e.*, in 85.72%.

It is of interest to note that some patients have been going on with the treatment at intervals for years, even four or five years in some cases, and find it of great value.

In 30.51% of cases treated no benefit followed. In two of these cases initial improvement occurred, but the patients developed extreme hyper-sensitiveness to the streptococcus and even minute doses appeared to be harmful. With two exceptions, streptococci were present in all the vaccines used. In one case, five doses of T.A.B. were given intravenously, and the patient became worse. In another, 12 doses of pneumococci were given with a maximum of 600 million, with some benefit. One case of failure was given only two doses of streptococcal vaccine, and another died after two doses. Of the remaining failures, "very little improvement" in five cases was interpreted as meaning no improvement.

The highest maximum dose was 10,000 million streptococci and 4,350 million staphylococci. This was the twenty-seventh dose and the patient was much better, but the asthma, which had been in existence for 27 years, recurred later.

The smallest maximum dose was 50 million streptococci. This was the sixth dose to a child who showed improvement.

The causes of failure in asthma are many. Nasal obstruction plays a part in some cases, and in this series one of those recorded as cured probably owed the success to surgical measures rather than to the vaccine.

Owing to the fact that streptococcal infection is only one of the factors in the causation of asthma, it could hardly be expected that uniformly good results would follow immunisation with that organism. Preliminary sensitisation tests for proteins, bacterial as well as others, should give some indication of the chances of improvement in a given case.

The obscurity of the causes influencing both presence and absence of attacks does not make it easy to decide what measures will be of value.

Vaccine treatment, however, if the individual is hyper-sensitive to the organisms, and if the dosage is carefully adjusted, offers a very fair chance of improvement and is worthy of a trial.

In the *miscellaneous group* three cases of persistent pneumococcal lung infections are included; one case, of 11 years standing, improved after a course of 34 injections of a mixed streptococcal and pneumococcal vaccine, the maximum dose being 4,250 millions.

Another case recovered from an attack of pneumonia that lasted for two weeks, during which time a vaccine was administered—but the cure cannot be attributed to its agency. Two cases of pulmonary abscess did not improve, and subsequently died, as did also the other five included in the group. These cases were, practically all, unsuitable for vaccine treatment.

SUMMARY.

The percentage of cases showing improvement in respiratory lesions as a whole does not offer a true picture of results, owing to the high percentage of failures in atrophic rhinitis.

Administration of suitable vaccines in appropriate doses to selected cases, with due care as to the points previously mentioned, offers a good hope of improvement in colds and their sequelae, and in bronchitis. It offers some hope of improvement in asthma, in cases where the organism is one of the sensitising agents, and is worth a trial in bronchiectasis. Some other chronic lung infections may show a degree of improvement, but lung abscess and other destructive lesions are not likely to benefit.

DISEASES OF THE URINARY SYSTEM.

The cases of urinary infection treated by vaccine, and of which adequate notes were procured, numbered 92. The results of treatment are recorded in the accompanying table.

Cured, apparently by Vaccine.	Cured, by means other than Vaccine.	Improved, apparently by Vaccine.	Improved, by means other than Vaccine.	Not Benefited.	Relieved, but Recurred.	Total.
19 or 20.65 %	9 or 9.70 %	28 or 30.34 %	2 or 2.17 %	26 or 28.20 %	8 or 8.7 %	92 —

It will be seen that 11 cases benefited as a result of treatment other than vaccine. This was known to be true of these cases, and may be so of some of the others. Cases are regarded as cured when free from subjective symptoms, when pus is absent from the urine, and a catheter specimen gives no growth on culture media. There were 55 cases or 59.69% who showed benefit during the administration of, and possibly due to, the vaccine. With two exceptions the organisms used in every case were coliform bacilli.

Staphylococcus albus and streptococci were the organisms used in the two exceptions, and both cases seemed to show some improvement during treatment. The number of doses varied from six to 63, with an average of 23. The initial dose of coliform bacilli was 5, 10, or 15 million, the highest maximum was 5,000 million, and the lowest maximum 55 million.

Among those showing improvement there were three cases of pyelitis of pregnancy. The number of doses given in these cases was 9, 36, and 13, with a maximum of 150, 190, and 240 million respectively.

Many of the failures in these urinary tract infections are due, as has been mentioned elsewhere, to gross mechanical defects and irritative conditions, which render any attempt to cure by raising immunity a futile procedure; these same factors operating to a much less extent may, in many cases, be the unrecognised cause of failure. It is quite possible, however, that an increased dosage may eventually prove a factor in reducing the failures. It has been noticed that a few cases, given high dosage attended by reactions, have seemed to derive benefit therefrom.

Bearing these points in mind, it would seem that in chronic pyelitis or even cystitis in which obvious mechanical fault is absent and tuberculous disease excluded, it might be of advantage to produce protein shock at intervals during immunisation, preferably by some foreign protein, and so imitate the effect of an acute exacerbation, which sometimes terminates a chronic infection.

Regarding the failures, which number 28.20%, one case had a tuberculous kidney, and several were old people, at least three of whom were known to have cystocele. Two cases died during vaccine administration, showing that serious disease was present.

The cases, numbering nine, which were cured by other means, proved to be unsuitable for vaccine therapy, the condition present demanding rather surgical interference. Foreign body, such as hairpin in the bladder, renal calculi, and so forth, are included among the conditions met with.

The treatment of urinary infection by vaccine must be regarded as on the whole a disappointment. It is never the method of choice, but when the usual remedies have failed it is possible that in a small proportion of cases good results may follow, especially as more is learned regarding suitable dosage.

ARTHRITIC CASES.

RHEUMATOID ARTHRITIS AND ALLIED CONDITIONS.

GONORRHOEAL ARTHRITIS.

In the section of diseases classified under arthritis are included some allied conditions—fibrositis, sciatica, osteoarthritis. It will readily be realised that not only is classification of cases hardly possible, but in most the beneficial results achieved may mean only mitigation of pain and stiffness, and possibly loss of acute symptoms. In some it has meant the possibility of returning to work, and in one case of infective arthritis from oral sepsis, removal of all the teeth and the administration of a streptococcal vaccine transformed a completely crippled man into a breadwinner, and though years have passed he has had no recurrence.

The total number of cases as shown in the table below was 64. The proportion of these which were cured, 7.8%, is naturally low, and with one exception only all the cases were incipient.

It is obvious that in a disease subject to remissions little emphasis can be laid on the results obtained until the passage of time has proved them correct or otherwise.

	Cured.	Improved.	I. S. Q.	Total.
Rheumatoid Arthritis	5 or 7.81 %	45 or 70.30 %	14 or 21.875 %	64 —

Of the cases classified as improved, 18.75% were stated to have shown very great improvement. The remaining 21.87% were unrelieved; among these were six cases of rheumatoid type in whom no infective focus as a cause of the disease could be demonstrated. One of them, crippled in all the joints, discontinued treatment after 12 injections of autogenous streptococcal vaccine—another, in whom the condition dated from childhood and who was completely crippled, had 10 doses of a mixed autogenous streptococcal vaccine, 67 doses of

autogenous coliform bacillus vaccine, 25 doses of a B.C.C. vaccine intravenously, and is stated to have benefited; as however, a radiograph showed advanced joint changes and as she was still unable to walk, it is clear that no material gain resulted from the treatment. A number of similar cases could be quoted.

Of the improved cases 31 were given B.C.C. or T.A.B. vaccine intravenously to produce protein shock. The number of doses varied from one to 26, the average being eight. The initial dose was 10-30 millions, the maximum 700 millions.

A note was made in a number of instances that, after the third injection there was diminution of pain and stiffness, and some patients who were carried into hospital recovered sufficiently to walk out.

In one case intramine and in another thyroid extract were given concurrently, and it is possible that these drugs were factors in the production of the good results obtained.

In the five cases cured, four had subcutaneous injections of streptococcal vaccine, three had in addition B.C.C., whilst one had two intravenous injections of 30 million B.C.C. The number of doses in the four cases was 12 in one, and in the other three, over 30.

If we take the 50 cases who showed benefit, 78.11%, and regard this as due in any degree to the vaccine treatment, it means that in these injections, intravenous and subcutaneous, we have a method which is useful and which may be valuable. It probably does not cure, at least by itself, but acts as an adjuvant to cure, and in the infective types should not be neglected.

Where conditions are suitable and there are no contra indications, it is distinctly helpful to use protein shock therapy as well as a specific vaccine.

It is to be hoped that further methods of producing protein shock will be devised so that the dose required to produce a reaction will be determinable beforehand.

The high percentage of improvement in cases of *gonorrhoeal arthritis* suggests that vaccine therapy is a useful adjuvant to other forms of treatment. The proportion of cases showing benefit as indicated by the following table represents 87.2% of the total number.

	Cured.	Improved.	I. S. Q.	Total.
Gonorrhoeal Arthritis.....	1 or 1.40 %	61 or 85.80 %	9 or 12.81 %	71 —

It is impossible to say how many of these cases would have improved to the same degree without vaccine.

It is noticeable from the records that the best results, as is usual in most infections, were obtained in acute cases of short duration. In the one case reported as cured eight doses were given ranging from one to 15 millions, and if the vaccine did not cause the good result, at least we can be assured that these small doses were not harmful. In the cases showing improvement, the number of doses varied from six to 38, with an average of 16; the highest maximum dose was 2,500 millions mixed gonococcal vaccine and the lowest maximum 15 millions. Intravenous injections were given in five cases—each received three, four, 11, 10, and seven doses respectively. T.A.B. was given in two and B.C.C. in three of these, the maximum

dose varying from 15 million T.A.B. to 400 million B.C.C. Improvement was recorded in all. Intramuscular injections were used in one case.

The lowest number of doses given to the group that showed improvement was three, the highest 30—the average being seven; the lowest maximum was 20 millions, the highest 1,000 millions. The latter case was one of long standing with recurrences; previously improvement was said to have taken place. Another member of this group was an alcoholic, who was erratic in his attendance. It is possible that improvement may have resulted in other members of this group had treatment been further prolonged.

On the whole gonorrhoeal arthritis shows a definite tendency to improve under vaccine treatment, and is usually resorted to early. The patients themselves usually believe it to be valuable, and are anxious to continue.

Exacerbations, *i.e.*, general and focal reactions after injection do occur sometimes, but can usually be avoided by the adoption of a very low dosage, in febrile cases, and by keeping the massage days and vaccine days separate. Actually by massage a considerable amount of auto-inoculation takes place. Reactions often occurred which were inexplicable, until it was realised that they only happened on those days when massage and injections were both given.

In gonorrhoeal arthritis treatment by stock vaccine is definitely of value; intravenous or protein shock therapy has also proved beneficial. Early treatment, carefully graduated dosage persisted in until active signs of the disease cease, gives good results.

SUPPURATIVE CONDITIONS.

(a) CARBUNCLES, BOILS, FURUNCULOSIS.

(b) SUPPURATION UNCLASSIFIED.

The cases in this group were considered together, partly because they are difficult to distinguish from the description furnished, and partly because there is a great similarity both in bacterial flora and in response to vaccine treatment.

Cured.	Improved.	Improved but Recurred.	Cured after Recurrence.	I. S. Q.	Total.
103 or 65.60 %	25 or 15.92 %	12 or 7.65 %	6 or 3.82 %	10 or 6.39 %	156 —

There were 156 cases of which 103 or 65.6% are considered as cured, 25 or 15.92% improved, 12 or 7.65% improved but recurred, 6 or 3.82% cured after recurrence, and 10 or 6.39% not benefited. The number of cases finally cured, therefore, was 109 or 69.8%, while those improved bring the cases which were benefited up to 85.9%.

The organism was in every case of cure a *Staphylococcus*, in almost all cases *Staphylococcus aureus*.

Stock *Staphylococcus aureus* vaccine was used in nine cases in which cure occurred. One case first treated by a stock vaccine was cured only after the administration of an autogenous one.

In the cured cases the highest number of doses was 24, the lowest three and the average 10. The highest and lowest maximum doses were 6,000 and 250 million respectively.

In the improved cases the number of doses varied from three to 30, with an average of 14, a rather higher figure than in the cured

cases. The highest and lowest maximum doses were 3,000 and 100 million respectively.

In one of the cases that was cured after recurrence a haemolytic *Streptococcus* was present. The largest dose of the second series of injections was 200 million *Streptococci* and 2,000 million *Staphylococcus aureus*, and the number given was 18.

Of the failures, one was a diabetic patient with a carbuncle which eventually caused his death; others, even on a repetition of a series of injections, were stated to show no response to the treatment.

In Wright's first series of inoculations he met one case in the six treated which did not respond, and it is obvious that some individuals with boils are resistant to specific immunisation. Various explanations have been offered. Wright suggested that the failure was an individual peculiarity giving rise to a lowered response to specific stimuli. Certainly 10 cases in this series showed no response—in some instances there was an initial improvement, but all the cases latterly became resistant even to greatly increased dosage.

These cases seem to demand, therefore, some other form of treatment, either by colloidal metals, protein shock, or a change in environment or nutrition, in order that a cure may be effected. Some peculiarity in carbohydrate metabolism has been thought to be a factor in some cases. There may or may not be an increase in the blood sugar. In these cases cure may be hastened by a limitation of the carbohydrate intake.

On the whole the treatment of boils and carbuncles by vaccines is successful, and gives a high proportion of cures. If boils and pustules are recurrent and difficult to clear up, it is both a curative and prophylactic measure and gives very good results. This, of course, does not mean that surgical procedures can be replaced by vaccine treatment. The presence of pus in these conditions, as in all others, demands free drainage, but in the stage before pus formation the giving of vaccine, especially if combined with colloidal manganese injections, will often cause resolution and cure.

SUPPURATION UNCLASSIFIED (including Wound and Sinus Infections).

Cured.	Improved.	I. S. Q.	Total
10 or 30·30 %	12 or 36·36 %	11 or 33·33 %	33 —

Included in this section are a number of cases of abscesses in various situations. The organisms found were chiefly *Staphylococcus aureus*, in a few *Streptococci*, and in others again coliform bacilli were isolated. A few cases of osteomyelitis are included, though these cases, demanding as they do adequate surgical drainage, cannot, when this is at fault, be expected to greatly benefit from vaccine treatment. Vaccines do not usually prevent surgical interference in deep-seated suppurations. Early incision, where tension exists, may prevent the need for vaccine treatment by reducing damage to surrounding tissues. Early diagnosis and free drainage in cases of osteomyelitis, even when the infecting agent is proved to be a haemolytic streptococcus, as a rule renders the use of vaccine unnecessary. In one case, however, the diagnosis was delayed, and at operation extensive osteomyelitis of the tibia was disclosed. *Staphy-*

lococcus aureus was found, and a vaccine was administered. Cure resulted after many months, though the part played by the vaccine is difficult to estimate.

Another case, a boy of 14, who had extensive bone necrosis, was given a prolonged course of vaccine treatment, and eventually, after 14 months of illness, began to improve. The vaccine had to be cautiously administered owing to his poor general condition. He had 80 doses of a *Staphylococcus aureus* vaccine—the maximum dose being 1,500 millions. The initial dose was 20 millions.

The conclusions to be drawn embody the general principles expressed elsewhere, viz., that vaccine therapy is a poor aid to treatment in conditions demanding primarily adequate surgical drainage.

Wound and sinus infections have here been included with the unclassified suppurations, though in the section dealing with the vaccines made they were subdivided. In this series the number of cases recorded is small, and inadequate notes in many instances make a differentiation into definite categories almost impossible. As regards the results of treatment, the same remarks may be made in the case of all these conditions, viz., the need for thorough surgical treatment accompanied by sound asepsis. By means of the former good mechanical drainage is secured, and by means of the latter undue secondary infection is prevented. Vaccine treatment, in the absence of these requirements, is, as has been stressed in the present discussion, unlikely to meet with success, at all events from the point of view of cure, but may be a factor in raising immunity and thus throwing the balance on to the side of success.

SKIN INFECTIONS.

(a) ECZEMA, IMPETIGO, AND INFECTIVE RASHES.

Skin infections were treated by vaccines in 22 recorded cases; the details as to the conditions and the results are shown in the table.

Condition Present.	Cured.	Improved.	I. S. Q.	Total.
Impetigo.....	3	1	—	4
Sycosis	2	1	—	3
Paronychia	2	1	—	3
Miscellaneous	4	7	1	12
	50 %	45.45 %	4.55 %	22

These lesions show improvement in a high proportion of cases. Of the 22 cases, 11 or 50% were cured, 10 or 45.45% showed improvement, and one derived no benefit. The highest maximum dose was 10,000 million *Staphylococcus aureus*. This was given in a curious case of pustular infection of the hands which had existed from infancy. The boy, aged 14 or thereabouts at the time of treatment, was a constant attendant at the Out Patients' Department. His hands were greatly deformed, the fingers stiff and cicatricial, with crops of pustules and blebs of pus constantly appearing. He benefited to some small extent, by vaccine treatment, though the condition is not cured, and his hands remain practically useless.

Cases of impetigo showed definite improvement under vaccine treatment, and in some which had resisted the usual remedies, it seemed to be curative. It is not certain that a prolonged immunity results from inoculation. The number of doses given varied from four to

51, the average being 19. *Staphylococcus aureus* was the organism most commonly used, though *Streptococci* were present in seven cases, the haemolytic variety being found in four of these.

(b) ACNE.

Acne.—The records of 25 cases show that eight were cured, representing 32 per cent. Thirteen showed improvement, or 52%, and four or 16% were unimproved.

Cured.	Improved.	I. S. Q.	Total.
8 or 32%	13 or 52%	4 or 16%	25 —

The number of doses given was on the whole high, nine being the lowest recorded and 113 the highest, the average being 33. The lowest maximum dose of *Staphylococci* was 500 millions and of *B. acne* 10 millions, whilst the highest was 4,000 millions staphylococci and *B. acne* 1,000 millions.

It seems that in order to be effective this treatment must be persisted in for some considerable time—the average number of doses, 33, represents a period of at least four months, the injections being given bi-weekly.

Those who had very prolonged treatment were severe cases, and their chances of cure by any method did not appear good. One case, after 36 doses of *Staphylococcus aureus* vaccine, with a maximum dose of 2,500 millions, was recorded as improved, but when seen some years later had an extremely severe recurrence. Cultures yielded no growth on this occasion, and X-ray treatment was used with success.

It seems worth while to give vaccine to a case of acne if it is resistant to ordinary remedies. It is important to give *B. acne*, whether autogenous or stock, with the *Staphylococci*. If definite improvement does not occur after 12 doses other measures should be employed.

BLOOD INFECTIONS.

In this series 24 cases are included. Fourteen were of puerperal septicaemia and 10 were miscellaneous conditions.

In the puerperal cases seven of the 14 died. Of those that recovered there is mentioned in one case the drainage of a pelvic abscess as the cause of recovery. In another, numerous pyaemic abscesses were evacuated during her long illness, but eventually she recovered.

The organisms found in the blood were streptococci in most cases. In one case a gonococcal vaccine was given, but the condition of the patient was hopeless, and death occurred before a second injection. Another case in the series was treated with *B. coli* vaccine. The length of treatment varies with the severity of the disease. In the cases in which death occurred one, three, four, and five doses respectively are recorded. In those that recovered the largest number of doses was 35, and the smallest number 17. The maximum dose was 1,700 million haemolytic streptococci. The minimum dose in the series was half a million streptococci, but as a rule the minimum was one million repeated every two or three days until it seemed safe to raise it.

It is difficult from the statistical evidence to say anything definite regarding the value of vaccines in these cases. It seems, however,

to those who use the method that provided there is adequate care in dosage in the early stages, no harm is done, and that sometimes definite improvement appears to follow each injection.

There can be but little doubt that large doses of vaccine in such cases may actually be the cause of death. With due care, however, it is possible that good may result.

In the miscellaneous group of blood infections there were four cases of infective endocarditis. A streptococcal vaccine was used in three cases. Two of these died, and the result in the third case is not recorded. In another case *Staphylococcus albus* was obtained (obviously a contamination) and a vaccine administered without benefit.

Of the remaining six cases, four died after longer or shorter courses of vaccine treatment. Two recovered; one with a cellulitis following septic phlebitis had 26 doses of streptococci with a maximum dose of 430 million. The other had seven doses with a maximum of 60 million streptococci, and showed improvement sufficient to allow of his leaving hospital. This last case was one of septicaemia following an infected wound.

The same remarks apply to these cases of septicaemia as to the puerperal infections already discussed. Careful dosage with a suitable organism probably does no harm, and in certain cases has appeared to be of benefit.

Enteric Fever.—The records of 13 cases of enteric fever treated by intravenous injection of *B. typhosus* vaccine show that of these cases 11 recovered and two died. Three had one dose, five had two doses, one had four doses, and in the remaining four cases, the number of doses is not stated.

Dosage 5 and 25 million given in 1 case (this case later died of pneumonia).

10 and 20 million given in 2 cases (both recovered).

75 and 50 million given in 1 case (recovered).

75 million given in 1 case (recovered).

100 million given in 3 cases (recovered).

50 and 100 million given in 1 case (recovered).

In one case in the third week of the disease the temperature, after the initial rise following the injection, fell to normal and remained there. In another the treatment appeared to have little effect apart from the reaction—in others it seemed to be beneficial. In one case, in which the gall bladder was acting as a reservoir for typhoid bacilli, intravenous injection of *B. typhosus* appeared to aid in clearing up the condition. Though this treatment has appeared to be of benefit in certain cases, the well-recognised risks associated with intravenous therapy in general have militated against its use.

One cannot draw conclusions from such a small series of cases, as to the efficacy of this form of treatment, but apart from the disadvantage of the intravenous route it may prove a useful measure in certain cases.

UTERINE, CERVICAL, AND VAGINAL INFECTIONS.

Nine cases of leucorrhoea were treated by vaccines according to the cases recorded. None of these were Hospital patients, and full details as to the aetiology, organisms used, or their dosage, are not given. The types of organisms found have been dealt with in discussing the preparation of vaccines in these cases. In every case a mixed vaccine was used. The results as reported show that five

cases were apparently cured. The local symptoms disappeared, and the general condition was much improved. An increase of two stone in weight is reported in one case, and of one stone in another. In one case additional treatment is mentioned, consisting of a curette and douches. The vaccine given was of staphylococcus and a diphtheroid bacillus—the maximum dose being 5,500 millions.

Of the remaining four cases all are reported as showing improvement, though in two instances it was of temporary duration.

Though the results of treatment in this short series are encouraging, they serve as a stimulus to further experiment, rather than as a basis for conclusions. The lack of detail as to the exact nature of the lesion, the vaccine used, and the dosage employed, forbid any expression of opinion, especially as there is little information available as to concurrent treatment.

EYE INFECTIONS.

In this series there were 30 cases in which details as to treatment and its result were obtained. Eighteen cases were given old tuberculin, and 12 were treated by vaccines, either stock gonococcal or autogenous.

By far the best results were obtained in those cases treated by old tuberculin and gonococcal vaccine respectively. All showed some degree of improvement. Seven cleared up completely in the former, and three in the latter series.

The results recorded in those cases treated by autogenous vaccines are less favorable, some 50% showing improvement. This is no doubt partly due to the serious nature of the diseases present.

The only conclusion one can reach, though perhaps not justified by so small a series, is that in chronic eye conditions tuberculin and gonococcal vaccine therapy are valuable aids to treatment in selected cases.

TUBERCULOUS INFECTIONS.

Tuberculin therapy has been employed in 74 cases of tuberculous disease. A cure has been claimed in only one instance, that of a case of spinal caries, but probably it would have been wiser to speak of "arrest of disease" rather than cure.

The percentage of improved cases is highest in glandular tuberculosis, and a study of the records show that cases of renal and vesical tuberculosis also respond well. Of 14 cases suffering from infections of the urinary tract three obtained no benefit, two of them dying, and six had the infected kidney removed followed by a course of tuberculin with very great improvement. One case was apparently well for some eight years when signs of spinal disease developed. The remaining five cases suffered from cystitis of tuberculous origin, and after prolonged treatment from tuberculin showed remarkable improvement. Two were afterwards able to work, one of them doing full time. Their treatment extended over a considerable period; in one case 77 doses were given in 14 months, and in another 108 doses in two years. When cystitis is present the distress is very great and patients are grateful for the relief obtained from the injections.

Of 14 cases of bone tuberculosis 71 per cent. showed improvement; the parts affected were the spine (3), hip (1), knee (1), ankle (1), sternum (1), and wrist (1).

The dosage given was less than in the urinary affections, but in both the bone and urinary series the greatest number of doses was given in cases that did not do well.

In pulmonary tuberculosis the results are not strikingly favorable; indeed it is difficult to say that improvement would not have occurred in any case. In one instance after prolonged tuberculin treatment, the pulmonary condition appeared quiescent, but severe adenitis called for surgical intervention. It is further of interest to note that in this case P.T. was given up to 53 mg.

The cases of skin infection showed remarkable improvement when under treatment, and very possibly this was directly due to the injections. In one instance the lesion was later regarded as syphilitic and further tuberculin treatment was discontinued.

Taking the series as a whole one feels that in renal tuberculosis where only one kidney is affected and nephrectomy has been performed, tuberculin therapy has a very definite value. It helps to clear up residual foci, and certainly improves any existing cystitis. Moreover, where complete surgical eradication is impossible it certainly alleviates the suffering that results from the accompanying cystitis.

In bone and joint affections it is a useful adjuvant to rest and nutritional treatment, and in adenitis before or after the necessary surgical measures have been carried out. The value is not so obvious in pulmonary tuberculosis, but a few cases appear suitable for this type of therapy and derive benefit therefrom.

SUMMARY.

This paper has aimed at a comprehensive study of the question of immunity, especially with regard to its bearing on vaccine administration. The details as to the preparation and administration of vaccines as carried out at the Adelaide Hospital Laboratory have been given—this comprising *Section A*. (This section of the Thesis has not been printed.—Ed.)

In *Section B* one has dealt with the various infective conditions in which vaccine therapy has been called for. The type of organism found on cultural examination of the material submitted and the nature of the vaccine prepared have been discussed, as also the factors which influence the demand for vaccines in any particular condition. The number made in each of the years from 1914 to 1925 and the organisms used in their preparation have been indicated.

Section C deals with the results of vaccine treatment as revealed in an analysis of 1,083 case records. A brief summary of the conclusions to be drawn from these results may be made at this juncture:—

- (1) In *Respiratory Infections* vaccines are of undoubted value both therapeutically in the treatment of *Common Colds and Their Sequelae* including *Bronchitis* and also as a prophylactic measure to prevent their recurrence. Adequate graduated dosage of the causal organisms is essential.

This treatment is of no value in infections due to the *B. ozaenae* (*Atrophic Rhinitis*).

In *Bronchiectasis* some benefit may follow.

Asthma is a condition in which a fair proportion of cases show definite improvement. When the organism used is known to be a causal factor, good results are often obtained. In the majority of these conditions the streptococcus is the organism most likely to be of value. *Pneumonia* and *Empyema* are conditions unsuitable for vaccine therapy.

(2) *Urinary Infections* (non-tuberculous).

Acute pyelitis and *cystitis* should not be treated by vaccines. Cases of chronic pyelitis and cystitis, when medicinal measures have failed, and when the need for surgical interference can be eliminated, or when the latter is impossible for any reason, may be given vaccine treatment with, in a few instances, good results.

Coliform bacilli are present in more than 70% of the cases.

- (3) The vaccine treatment of *Arthritis*, both rheumatoid and gonococcal, has shown some encouraging results. Streptococcal vaccines in the former and stock gonococcal in the latter have been chiefly used.

A number of cases treated by intravenous injections of B.C.C. and T.A.B. have shown improvement, especially as regards diminution of pain and stiffness. In some instances crippled patients have been enabled to return to work. It has been shown that when serious structural changes in the joints have occurred, complete recovery is impossible. A combination of specific and non-specific therapy is sometimes desirable.

- (4) In the case of *Carbuncles*, *Boils*, &c., autogenous vaccines show the highest percentage of cures, and year by year there is an increasing demand for them in the treatment of these conditions. A certain proportion of cases, some 14%, seem unable to react to staphylococcal immunisation beyond a certain point, and in these cases it is useless to persist in the treatment.

Staphylococcus aureus is usually the causal organism.

- (5) In the general *Suppurations—Wounds and Sinuses* the principle is laid down that drainage and asepsis are essential, and that unless there is a failure in specific immunity good surgery needs little help from vaccine therapy.

- (6) *Skin Infections* have shown good results from vaccine treatment, though the course of injections is as a rule long, and a repetition may be required.

Prolonged immunity does not always appear to follow after inoculation in the case of eczema, impetigo, infective rashes, &c.

- (7) In *Acne* some cases show benefit following vaccine treatment when local measures have failed to influence the condition. Improvement, if it is going to take place, as a rule manifests itself after some nine to 12 doses of *Staphylococcus albus* or *aureus* (autogenous) combined with autogenous or stock *B. acne* vaccine.

- (8) *Uterine and Vaginal Infections* comprise a short series of cases in which favorable results are reported. These require confirmation. It is possible that vaccine treatment is of some use in these conditions, especially if combined with local applications, &c.

- (9) *Blood Infections*.—In puerperal septicaemia, due as a rule to the streptococcus, vaccine treatment may do good. Great care is needed in giving a small initial dose with a very gradual increase in the amount given. Only when these precautions are taken is vaccine treatment likely to be safe.

In septicaemia due to other causes, *e.g.*, infective endocarditis, the results, in this series, were uniformly bad. Two of the cases diagnosed as "septicaemia" recovered, but the part played by vaccine treatment is not known. In enteric fever

the intravenous administration of *B. typhosus* vaccine is discussed. The series is too small to allow of generalisations, but apart from the disadvantages attending intravenous medication, the method may prove a useful adjunct to treatment.

- (10) *Eye Conditions*, especially when chronic, have shown excellent results following upon tuberculin therapy.

Gonococcal vaccine has proved of benefit in cases presumably due to this infection.

Autogenous vaccines have proved to be of less value in the treatment of eye infections.

- (11) *Tuberculin therapy in renal conditions* (when one kidney is affected) is valuable after nephrectomy, in helping to clear up residual foci and improving any existing cystitis.

It is a useful adjuvant in *Bone and Joint* affections, and in *Adenitis* when any surgical measures required have been carried out.

The value in *Pulmonary Tuberculosis* is not so obvious, but a few cases appear to derive benefit from this form of treatment.

- (12) It may be of interest to append a table showing the order in which cure has been recorded in the different classes of disease.

This gives the trend only of vaccine successes, various considerations greatly modifying the results.

In respiratory diseases taken as a whole, for example, 13.4% represents the cases cured. This figure is, of course, influenced by all the cases, such as those due to *B. ozaena* infections, and such conditions as pneumonia, lung abscess, etc., which were failures.

In the urinary conditions, only those cases which were cured by vaccine treatment alone are included. Other cases in which cure was ultimately brought about by surgical measures though benefited or otherwise by vaccine therapy are not considered.

In the case of carbuncles, boils, furunculosis, &c., those regarded as cured outright are included—those cases which were cured or improved after recurrence are excluded, so that the ultimate results in these conditions would show a much larger proportion of successes. The number of cases in which details as to results of treatment in uterine and vaginal, in blood infections, and eye conditions, are too few to warrant tabulation.

Condition Treated.	Result.				Total.
	Cured.	Improved.	I.S.Q.	Died.	
Carbuncles, Boils, Furunculosis, etc.	65.6%	15.9%	6.3%	—	156
Skin Lesions	50%	45.4%	4.5%	—	22
Acne.....	32%	52%	16%	—	25
Suppurations—Unclassified ..	30.3%	36.3%	33.3%	—	33
Urinary Infections.....	20.6%	30.3%	28.2%	—	92
Tuberculous Infections	13.5%	52.7%	31.0%	2.7%	74
Respiratory Infections	13.4%	39.3%	44.5%	2.5%	193
Rheumatoid Arthritis	7.8%	70.3%	21.8%	—	64
Arthritis—Gonococcal	1.4%	85.8%	12.8%	—	71
Uterine and Vaginal Infections					9
Blood Conditions (including Enteric Cases).....					34
Eye Conditions (including Tuberculin Treatment).....					30
Total.....					806

- (13) It may be claimed in conclusion that such an investigation as this paper embodies has brought into prominence the value or otherwise of vaccine treatment in the various conditions dealt with.

The value of this form of treatment (at present partly but not fully recognised by the profession) in certain *Respiratory Infections* is emphasised.

It has been shown that the use of vaccines in *Urinary Infections* is by no means as fully justified as the demand seems to show.

The treatment has been shown to be of value in many cases of *Arthritis*, especially in the alleviation of distressing symptoms.

It has confirmed the impression that vaccine treatment is of great value in *Carbuncles*, *Boils*, &c., and that there is a small residue of cases which fails to react to this measure.

In *Skin Infections* of a suppurative type it has been shown to have value, and in the more chronic condition of *Acne* to benefit a considerable proportion of cases.

In *Suppurations in general* it has been contended that in the class of case included under this heading sound surgery and asepsis are essential, and that in the absence of these vaccine therapy is a poor aid to treatment.

It has been shown that in catarrhal conditions of the *Vaginal* tract some success has been reported, and in *Puerperal Septicaemia* some practitioners believe that vaccine treatment, given with due precaution, is beneficial. In septicaemia of other origin, however, vaccines are of little value.

The advantages from the use of tuberculin (O.T.) in chronic eye conditions have been discussed and an extension of this treatment with a further knowledge of its limitations and advantages predicted.

The value of tuberculin treatment in urinary, glandular, and bone tuberculosis is confirmed.

In conclusion, regarding the infecting agent as the seed and the host as the soil, it may be stated once more, that any process (such as the raising of specific immunity) which renders the latter less suitable as a breeding ground, may play a definite part in the prevention of disease. In many cases this effect may be too trifling to consider, in some it may be of definite value, though this may not be obvious, and in others again it may appear to be of prime importance.

The fact that the value of therapeutic immunisation is difficult to assess should not prevent its use in cases where complete cure cannot be expected as a result of its agency. Improvement in regard to specific immunity may be a step in a series of progressions, the final result of which is cure.

VI.—THE PATHOLOGICAL LESIONS PRESENT IN 1,000 POST MORTEMS AT THE ADELAIDE HOSPITAL.

(By J. Burton Cleland, Hon. Pathologist.)

Commencing with 1920 and ending with the eightieth *post mortem* of 1925, 1,000 autopsies have been carried out at the Adelaide Hospital, most of them by myself, and in a number of the other cases I have examined the specimens removed from the *post-mortem* table. At the end of each *post mortem* a summary is made of the pathological lesions which are present, and the presumed immediate cause of death is stated. The pathological lesions present in these 1,000 *post mortems* have now been tabulated under their respective headings, together with the other associated lesions. Thus, under "Gall-stones," for instance, all the autopsies which showed the presence of such have been indexed giving the number of the *post mortem*, sex, and age of the patient, and all the other pathological conditions that were found in the body. It can thus be seen at a glance how many cases of any particular pathological condition have been met with, and the sexes and ages of the patients, together with any other pathological conditions that were present. Tabulated in this way we may find unexpected correlations between various pathological conditions. Any case which from its epitome seems to be of particular interest can also readily be consulted, either in the *post-mortem* book or from the case records.

It is proposed, in this number of the *Archives*, and in succeeding numbers, to set out the findings under the various headings. The pathological lesion which is embraced under the heading will be italicised. That is, pathological lesions not italicised will be found catalogued again under their appropriate headings. Thus, a patient showing carcinoma of the rectum, gall-stones, and atheroma of the aorta, would appear under each of those three headings; under the heading "Carcinoma of the Rectum" that lesion would be italicised, and under the heading "Gall-stones," the gall-stones would be italicised, and so on.

The data thus supplied will form a permanent record of the nature of cases that have passed through the *post-mortem* room, and will, it is hoped, prove of use in the future to others.

NEOPLASMS.

SQUAMOUS EPITHELIOMATA OF THE ORAL CAVITY, NECK, ETC.

- 40/20, M., 78.—*Epithelioma in submaxillary glands.* Acidosis following ChCl_3 . Large pale liver.
- 91/20, M., —.—*Operation for epithelioma of lip and glands.* Oozing of blood. Sudden death. Fat smelt of ChCl_3 .
- 128/21, M., 72.—Tuberculosis of lungs with cavity and fibrosis. *Operation for epithelioma of tongue.*
- 119/22, M., 70.—*Haemorrhage after operation for recurrent glands in neck.* (?) Cerebral embolism from detachment of clot on aortic plaque, marked atheroma.
- 54/25, M., 57.—*Epithelioma of tonsil and jaw.* *Operation.* Pus in mediastinum and left pleura from laryngotomy wound. Hypostatic congestion of lungs.
- 118/21, M., 70.—*Epithelioma of larynx with secondary glands in neck.* Broncho-pneumonia.
- 160/21, M., 72.—*Fungating malignant mass in neck, lymph glands involved.* Deposits in lungs, mesentery.

- 174/21, M., 52.—*Diffuse epitheliomatous infiltration of neck, secondary to tongue or lip, with pyogenic infection. Deposit pressing on superior vena cava. Mulberry-like warty peritoneum over kidney region.*

RODENT ULCERS.

- 88/24, M., 67.—*Epithelioma (approaching rodent type) behind ear, extending into middle fossa. Broncho-pneumonia and hypostatic pneumonia. Small infective cavity in lung.*
89/24, M., —.—*Rodent ulcer of scalp invading skull and brain.*

CARCINOMA OF THE OESOPHAGUS.

- 21/22, M., 48.—*Carcinoma of oesophagus.*
76/22, M., 61.—*Carcinoma of oesophagus. Empyema, pericarditis. Marked syphilitic (?) aortitis.*
129/22, M., 63.—*Carcinoma of lower end of oesophagus. Deposit in liver.*
153/22, M., 75.—*Carcinoma of oesophagus. Deposit in mediastinal glands, invasion of lung with gangrenous cavity.*
166/23, M., —.—*Carcinoma of oesophagus. Tuberculous broncho-pneumonia.*
65/24, M., 73.—*Carcinoma of oesophagus.*
97/24, F., 68.—*Carcinoma of oesophagus with extension to cardia. Dilation and ulceration of oesophagus above.*
172/24, M., 56.—*Carcinoma of oesophagus (two ulcers). Peritonitis from gastrostomy. Lobar pneumonia and empyema.*
180/24, M., 80.—*Carcinoma of oesophagus, opposite bifurcation of trachea. Perforation of bronchus. Gangrene of lung. Dermoid under chin.*

CARCINOMA OF STOMACH.

- 20/20, F., 66.—*Carcinoma of stomach. Secondary deposit in liver. Infarct in lung.*
23/20, M., 68.—*Carcinoma of stomach. Spots of fat necrosis in pancreas.*
32/21, M., 48.—*Carcinoma of stomach. Deposits in liver and glands.*
38/21, M., —.—*Carcinoma of stomach. Deposits in liver. Acute cholecystitis. Suphrenic abscess.*
46/21, F., 59.—*Carcinoma of cardiac end. Atheroma of aorta. Thickened mitral valve. Infarcts in kidney. Softened areas in brain.*
102/21, M., 59.—*Carcinoma of lesser curvature. Abscess of liver adjacent to the growth. Peritonitis. Pus near left wrist joint.*
121/21, M., 61.—*Carcinoma of pylorus. Deposits in glands, omentum, bladder, lungs, liver.*
129/21, M., 71.—*Carcinoma of stomach.*
154/21, M., 65.—*Carcinoma of pylorus and lesser curvature. Deposit with ring cancer in ileum, compressing ureter; distended ureter with right hydronephrosis. Deposit invading rectum.*
183/21, M., 67.—*Carcinoma of pylorus. Deposits in liver, glands.*
194/21, M., 59.—*Chronic ulcer of stomach (?malignant).*

- 50/22, M., 46.—*Adeno-carcinoma involving stomach, transverse colon, &c. Secondary deposits in liver, lungs.*
- 79/22, M., 75.—*Fungating carcinoma of stomach.*
- 90/22, M., 18.—*Carcinoma of stomach. Carcinomatous peritonitis. Distension of gall-ducts.*
- 148/22, M., 55.—*Carcinoma of stomach. Deposits in liver and mesentery.*
- 160/22, M., 54.—*Carcinoma of stomach, polypoid, and infiltrating. Pancreatic calculi and fibrosis. Infarcts in lung, and thrombi adherent to pulmonary artery.*
- 78/23, F., 70.—*Carcinoma of stomach. Deposits in liver, small intestine.*
- 84/23, M., 49.—*Carcinoma of stomach. Permeation of lymphatics of lungs. Deposit in supraclavicular gland. Thrombosis of subclavian. Infarcts in lungs.*
- 94/23, M., 73.—*Carcinoma of stomach. Secondary deposits in liver, lung, mediastinum, supraclavicular gland.*
- 163/23, M., 55.—*Carcinoma of stomach. Deposits in liver, subcutaneous tissues, spleen, kidneys, heart, pleura, peritoneum.*
- 165/23, F., 53.—*Carcinoma of stomach. Gastrectomy. Localised peritonitis. Only one kidney.*
- 193/23, M., 63.—*Carcinoma of stomach. Carcinomatous peritonitis.*
- 31/24, M., 59.—*Carcinoma of cardiac end of stomach. (?) Pernicious anaemia. Erythroblastic reaction in bone marrow. Some haemosiderin in liver.*
- 44/24, M., 41.—*Carcinoma of cardiac end of stomach. Numerous deposits in liver.*
- 51/24, M., 70.—*Carcinoma of stomach. Syphilitic aortitis and atheroma. Some dilatation of aorta. Arteriosclerotic kidneys.*
- 59/24, M., 64.—*Carcinoma of stomach. Secondary anaemia. Broncho-pneumonia.*
- 60/24, M., 49.—*Carcinoma of stomach. Secondary anaemia. Pulmonary tuberculosis, (?) arrested.*
- 90/24, M., 31.—*Carcinoma of stomach, secondary to chronic ulcer. Deposits in liver and glands. Fibrosing subcutaneous nodules.*
- 111/24, F., 33.—*Small gastric ulcer, wall malignant. Numerous deposits in lung like broncho-pneumonia or tuberculosis. Somewhat large malignant deposit in ovary.*
- 124/24, M., 67.—*Polyp of stomach with malignant ulcer at base. Death from patchy lobar and broncho-pneumonia.*
- 151/24, M., 64.—*Carcinoma of stomach. Extensive pulmonary tuberculosis (unusual). Degenerated hydatid of liver. (?) Infarct in kidney and pyelitis.*
- 192/24, M., 63.—*Extensive bedsore over sacrum. Pyelonephritis (?) from paralytic distension. Thrombosis of saphenous vein. Papillomatous area of stomach (malignant).*
- 216/24, M., 46.—*Portugese Indian. Carcinoma of stomach (?) invading pancreas. Adenomatous thyroid deposits in left side of neck.*
- 27/25, F., 54.—*Carcinoma of stomach (slightly colloid). Nodules on both curvatures. Glands in portal fissure. Operation.*

- 77/25, M., 68.—*Carcinoma of stomach (colloid)*. Calcified hydatid in liver. Pleuritic adhesions.
- 78/25, M., 59.—*Carcinoma of stomach (contracted hour-glass with a fundal diverticulum)*. Slight glandular involvement. Infaret in spleen. Lobar and hypostatic pneumonia. Small area of pulmonary tuberculosis. Chronic starvation. Atrophied heart
- 83/22, M., 72.—Chronic ulcer of stomach. Abscesses in lesser sac. In front of stomach, a cavity with malignant deposits in wall.

CARCINOMA OF SMALL INTESTINE.

- 55/25, F., 58.—*Carcinoma of small intestine(?)*. Operation. Recurrence. Deposits in serosa of small intestine with matting of coils and obstruction, sigmoid, colon, diaphragm, surface of liver and spleen, broad ligament.

CARCINOMA OF COLON.

- 130/20, M., 55.—*Columnar epithelioma, probably of splenic flexure, involving pancreas.*
- 45/21, M., 55.—*Carcinoma of sigmoid flexure. Secondary deposit in liver.*
- 120/22, M., —.—*Carcinoma of colon.*
- 123/22, F., 87.—*Carcinoma of transverse colon.*
- 159/23, F., 41.—*Carcinoma of hepatic flexure. Deposit in liver, Peritonitis.*
- 162/23, M., 71.—*Carcinoma of colon. Hypostatic pneumonia.*
- 195/23, M., 67.—*Fungating carcinoma of descending colon. Tuberculosis of lungs.*
- 51/25, M., 62.—*Carcinoma of colon. Secondary involvement of peritoneum and lymph glands. Deposit in liver.*
- 184/23, M., 56.—*General peritonitis after colectomy for carcinoma and appendicostomy.*
- 207/23, F., 47.—*Colostomy and removal of (?) malignant mass from sigmoid flexure. Leakage. Peritonitis. Gallstones. Inflamed tissue round left ovary and tube, indurated tissue at site of operation.*

CARCINOMA OF RECTUM.

- 127/24, M., —.—*Carcinoma of rectum. Involvement of glands and colostomy wound. Deposits in lungs. Congestion and atrophy of one kidney. Gallstones.*
- 135/24, M., 83.—*Carcinoma of rectum. Secondary deposits in liver and lungs. Purulent cystitis. Chronic intestinal nephritis.*

CARCINOMA OF LIVER.

- 110/20, M., 67.—*Atrophic cirrhosis of liver with primary carcinoma.*
- 118/20, F., —.—*Primary carcinoma of liver.*
- 82/22, F., 77.—*Primary carcinoma of liver. Slight interstitial nephritis.*
- 112/23, M., 42.—*Primary carcinoma of the liver, studded with secondary deposits. Haemorrhages from paracentesis abdominis. Meckel's diverticulum.*
- 188/23, F., 39.—*Carcinoma in liver and lymph glands.*
- 29/24, M., 65.—*Primary carcinoma of liver. Jaundice.*

CARCINOMA OF GALL BLADDER.

- 71/23, M., 62.—*Carcinoma of gall bladder. Biliary obstruction. Dilated channels along aorta filled with bile.*

CARCINOMA OF PANCREAS.

- 72/20, M., 59.—*Carcinoma of pancreas. Diffuse deposits (lungs, liver, muscles, ribs).*
- 18/21, M., 60.—*Carcinoma of pancreas. Pulmonary tuberculosis. Slight chronic interstitial nephritis. Dilated stomach.*
- 169/21, F., 53.—*Columnar epithelioma of head of pancreas. Large similar growth round gall bladder.*
- 192/21, F., 52.—*Carcinoma of pancreas. Pressure on bile ducts. Jaundice. Deposits in lungs.*
- 110/22, M., 53.—*Carcinoma of head of pancreas. Dilated bile ducts and gall bladder. Secondary deposit in lungs.*

CARCINOMATOUS PERITONITIS.

- 55/23, F., 47.—*Adhesive carcinomatous peritonitis. Primary growth not detected. Adhesions round gall bladder.*
- 65/25, M., 54.—*Carcinoma of peritoneum, probably secondary to growth of rectum. Adhesions.*

CARCINOMA.—PRIMARY SITE NOT LOCATED.

- 198/23, M., 79.—*Carcinomatous deposits in the liver, lungs, and pleurae. Red granular kidneys.*

CARCINOMA OF BREAST.

- 19/21, F., 47.—*Carcinoma of breast (removed). Secondary deposits in rib, brain, vertebra, carcinomatous cirrhosis of liver.*
- 143/21, F., 46.—*Fungating carcinoma of breast with deposits in axilla, lungs, heart, kidneys, liver. Empyema. Abscess of lung.*
- 144/21, F., 60.—*Fungating carcinoma of breast. Fibrotic kidneys. Left ventricle hypertrophied.*
- 133/22, F., 42.—*Old carcinoma of breast. Deposits in vertebrae, liver. Secondary anaemia with myelocytes.*
- 120/23, F., 46.—*Carcinomatous deposits in glands of neck, superior mediastinum, oesophagus, small deposit in liver. Thrombosis of great veins. (?) Primary over-looked in breast.*

CARCINOMA OF THE THYROID GLANDS.

- 161/24, F., 39.—*Tetanus (cryptic). Small carcinoma of thyroid.*
- 216/24, M., 46.—*(Portugese Indian.) Carcinoma of stomach and extension to pancreas. Adenomatous (carcinomatous?) thyroid deposits in neck.*

CARCINOMA OF THE LUNGS.

- 68/24, M., 54.—*Primary carcinoma of lung. Invasion of lung and of vertebrae. Collapse of lung. Bedsore.*
- 164/24, M., 78.—*Organisation of lungs with tuberculosis and primary carcinoma. Inspissated empyema. Gall-stones. Large spleen. Cyst in kidney.*

CARCINOMA OF THE KIDNEY.

- 15/21, M., 75.—*Grawitz tumor*. Slight pulmonary tuberculosis.
- 125/21, M., 61.—Pulmonary embolism from *Grawitz tumor*.
- 66/23, F., 43.—Primary (?) carcinoma of kidney. Secondary deposits in liver, lungs (?). Positive Wassermann.
- 17/25, F., 38.—Carcinoma involving kidney and suprarenal. Deposits in aortic glands, liver, lungs, and epicranial aponeurosis.
- 45/24, M., 41.—Renal carcinoma (right). Multiple deposits in subcutaneous tissues, muscles, lungs. Deposits in head of pancreas and heart.
- 38/25, M., 62.—Squamous epithelioma of pelvis of kidney. Removed. Recurrence. Infiltration to aorta, suprarenal, bladder wall. Carcinomatous peritoneum. Thrombosis of vena cava and common iliaes. Hypertrophied pylorus.

CARCINOMA OF THE BLADDER.

- 59/20, M., 70.—Operation for malignancy of bladder or prostate. Pyelonephrosis. Septic infarct of heart with haemopericardium. Large vesical calculus.
- 63/20, M., 83.—Malignant growth of bladder. Hydronephrosis. Hypertrophy of heart.
- 62/24, F., 70.—Carcinoma of bladder. Bilateral hydronephrosis and atrophy of renal parenchyma. Some hepatic cirrhosis.

CARCINOMA OF PROSTATE.

- 62/20, M., 63.—Heart disease. Hypostatic pneumonia. Early carcinoma of prostate. Secondary deposit in liver.
- 50/21, M., 68.—Carcinoma of prostate. Deposits along iliac vessels and on ribs. Myelocytes in blood.
- 25/22, M., 69.—Carcinoma of prostate. Hypertrophy of bladder. Suppression of urine. Hypertrophied heart. Large soft degenerated kidneys with haemorrhages.
- 73/23, M., 72.—Carcinoma of prostate. Deposits in periosteum of ribs, pericranium invading bone, dura mater, both suprarenals.
- 30/24, M., 66.—Carcinoma of prostate with secondary glands (iliac and aortic). Heart-block with (?) fibrous band at commencement of bundle of His.
- 104/24, M., —.—Carcinoma of prostate(?). Malignant retroperitoneal glands. Abscess and secondary deposit in lung.

EPITHELIOMA OF PENIS.

- 14/25, M., 39.—Epithelioma of penis. Deposits in liver, lungs, spine, with invasion of dura mater.

MALIGNANT GROWTHS OF THE SUPRARENAL GLAND.

- 168/21, F., 23.—Malignant tumor of right suprarenal with thrombosis extending into vena cava and pulmonary embolism. Marked moustache and beard.
- 190/24, F., 23.—Bilateral malignant adenomata of suprarenals with deposit on surface and in substance of lungs, in heart, mediastinal glands, and liver. Dysenteric ulceration of ileum and colon.

CARCINOMA OF THE UTERUS.

- 104/20, F., 63.—*Operation for epithelioma of vulva. Failure of wound to heal. Pulmonary embolism.*
- 113/21, F., 71.—*Necrosis of cervix uteri (? malignant), vaginal vault and part of bladder. Hydronephrosis.*
- 19/23, F., 26.—*Peritonitis after vaginal hysterectomy for cancer of cervix. Ileus.*
- 7/24, F., 24.—*Carcinoma of cervix. Operation. Secondary glands along vena cava. Dilation of ureters. Secondary pyelonephrosis.*
- 25/24, F., 35.—*Epithelioma of cervix. Enlarged pelvic and retro-peritoneal glands. Ulceration into bladder. Right-sided pyelonephrosis.*
- 112/21, F., 58.—*Extensive carcinoma of uterus, extending to vagina, peritoneum, and ovary. Perforation of growth into bladder. Small deposit in lungs. Ruptured ulcer of caecum.*

CARCINOMA OF THE OVARIES.

- 170/23, F., 58.—*Malignant cyst-adenoma of ovaries. Extensive infiltration of peritoneum. Adherent clot in pulmonary vein.*
- 63/22, F., 45.—*Ovarian cysts, both sides (one nearly solid). Deposit in liver. Gallstones (? malignant growth of gall-bladder).*

SARCOMATA.

- 137/20, M., 73.—*Retro-peritoneal sarcoma (?) with deposits in retro-peritoneal glands, pancreas, invading kidney, pelvis, lungs, subcutaneous tissues.*
- 9/23, M., 37.—*Lympho-sarcoma of small intestine. Bilateral malignancy of suprarenals.*
- 86/23, M., 79.—*Fibro-sarcoma of groin. Cerebral softening (? embolus of atheromatous ulcer). Broncho-pneumonia.*
- 198/24, M., —.—*Fibro-sarcoma of thigh. Secondary deposits (?) in right parietal and temporal lobes. Hernia cerebri.*
- 169/23, F., 18.—*Osteo-sarcoma of iliac bone. Deposits in lung.*
- 11/25, M., 58.—*Primary large-celled myxo-sarcoma of liver. Deposits in peritoneum, pleura, and lung. ?Multilobular cirrhosis also.*

MALIGNANT GROWTHS.—VARIOUS.

- 104/22, M., 55.—*Malignant growth in clavicle (primary in maxilla). Infarcts (?) in lung (old). Hypostatic pneumonia.*
- 111/22, M., 67.—*Tumour removed at Kewick Hospital four years ago. Nodule below mastoid. Deposit in lungs. Chronic nephritis.*
- 151/21, M., 71.—*Malignant retroperitoneal mass invading pancreas. Glands in abdomen, mediastinum, and posterior triangle. Distended gall bladder.*

MELANOMATA.

- 60/22, M., —.—*Non-pigmented melanoma (?) in loin, seeding in organs and glands.*
 37/24, F., 62.—*Melanotic deposits in organs.*

ENDOTHELIOMA.

- 71/24, M., —.—*Endothelioma developing on Hodgkin's disease, affecting glands of neck, mediastinum and retro-peritoneal glands. Secondary deposits in liver.*

OTHER NEOPLASMS.

- 88/21, M., 33.—*Caseating thymoma of mediastinum. Old pulmonary tuberculosis.*
 187/21, M., 45.—*Aneurysm of aorta. Broncho-pneumonia. Cardiac hypertrophy. Fibrous growth over spleen.*
 117/21, M., 70.—*Myeloma of second cervical vertebra. Compression of cord. Skull of unusual shape.*

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